"THE SIGNIFICANCE OF VITAL CAPACITY
IN
PULMONARY TUBERCULOSIS
INCLUDING
TREATMENT BY ARTIFICIAL PNEUMOTHORAX."

by

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1925
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INTRODUCTION.

In studying the Pathology of Pulmonary Tuberculosis I was struck by the insidious nature of its onset and by the minuteness of the early organic changes made by the tubercles.

In contrast, I noticed how crude and inadequate in this modern age of scientific advancement are our methods of diagnosis of the disease. Physical signs, the result of visual, tactile, and auditory tests, can only reveal, even in the hands of the expert, the comparatively gross changes in the properties of the lung, such as density, elasticity, conductivity and moisture. Radiography is not exact and does not profess to detect the early biological and cellular changes produced by the tubercles. The sputum test is the test of a later stage of the disease, and the various chemical, serological, and biological reactions are applicable to tuberculosis in the body as a whole and are incapable of limiting their verdict to the presence or absence of incipient tuberculosis in the lungs.

These early pathological changes in Pulmonary Tuberculosis must alter more or less the volume of the lung by destroying air-containing alveoli. Moreover, pathological involvement of any tissue leads to abrogation of function of that tissue indirectly through toxoemia produced by the causal organism as well as directly by physical changes. In the case of the lung tissue, the main function of which is to expand and retract by virtue of the elasticity of the alveolar walls, tubercular disease will impair its power of expansion and retraction.

If, therefore, a method could be devised capable of measuring the extent of expansion and retraction of the lungs, very valuable information would be obtained of the changes caused by the disease, and, that, if the normal extent of expansion and retraction for any individual were known, then the slightest deviation from that normal would signify the commencement of pathological change.

In Vital Capacity, which was defined by Hutchinson as the volume of air expelled by the greatest expiration following the greatest inspiration, we have the measure required.
I decided, therefore, to carry out a series of experiments on patients in whom the diagnosis of Pulmonary Tuberculosis was doubtful, and also on Tuberculous patients in all stages of the disease with the view of determining what clinical assistance can be obtained from periodical Vital Capacity readings in the diagnosis, prognosis and treatment of the disease. In other words, is there a definite relationship between Vital Capacity and (1) the degree of pathological anatomical involvement of lung tissue, and (2) the extent of systemic disturbance from the toxins of the tubercle bacilli?

It occurred to me, too, that in the treatment of Pulmonary Tuberculosis by artificial pneumo-thorax lay an opportunity of studying this relationship further, for in the collapse therapy one can control at will the extent of tissue change by regulating the amount of the insufflation.

On looking into the literature dealing with Spirometry, I found that since the days of Hutchinson much work has been done in finding the relationships between Vital Capacity and various body measurements, and in the application of Vital Capacity to various diseases, chiefly from the point of view of physical changes, but despite this, no systematic attempt has been made to correlate the factor of systemic disturbance in Pulmonary Tuberculosis with Vital Capacity nor to apply the science of Spirometry to the treatment of the disease by Artificial Pneumo-thorax.

In all 107 cases of both sexes and of ages ranging from 7 to 65 years were investigated from August 1924 to January 1925, at the Royal Victoria Hospital for Consumption, Edinburgh, where I was Resident Medical Superintendent.

For the purpose of clearness I propose to divide the subject matter up as follows:

(1) Anatomy, physiology, and pathology of Spirometry.
(2) History of Spirometry with exposition and criticism of previous workers.
(3) Results of my own investigations with summary and conclusions.
3.

CHAPTER I.

THE ANATOMY AND PHYSIOLOGY OF SPIROMETRY.

A knowledge of the anatomy and physiology of normal and forced respiration is essential if we are to understand properly the changes which take place in the respiratory function in Pulmonary Tuberculosis and during treatment by Pneumothorax.

The thorax may be considered as a completely closed box, the pressure in which at the end of expiration is roughly - 6 m.m. Hg. The act of inspiration is accompanied by an enlargement of the thorax thus further diminishing the pressure in the pleural cavity to about - 30 m.m. Hg, so that air rushes down the trachea into the lungs to equalise the pressure. The act of expiration is accompanied by a diminution of the thorax which in turn forces the air out of the lungs. The amount of air, therefore, taken in and given out with each act of respiration under normal conditions is regulated almost entirely by the extent to which the thorax can enlarge itself. This it does in all its diameters (1) Vertically, by the contraction and the scent of the diaphragm. (2) Antero-posteriorly, by the contraction of the external intercostal muscles and serratus posterior muscle and interchondral portion of the internal intercostal muscles pulling upwards on the downward slanting ribs and thus carrying the sternum forward. (3) Transversely, by the eversion of the lower borders of the ribs due also to the contraction of the above named muscles. In forced inspiration accessory muscles i.e. pectoral muscles, sternomastoid, trapezius and rhomboids are brought into play, while in forced expiration the additional muscles employed are those of the abdominal wall. It is obvious that the volume of air in the lungs at any given time will vary with the type and stage of the respiratory movement. The following nomenclature has been applied to these volumes viz:-

(1) Tidal Air or amount entering lung at each breath in quiet respiration. It varies approximately from 350cc. to 500cc.

(2) Complemental Air or additional amount of air which can be taken into the lungs by forced inspiration, about 1500cc.
(3) **Supplemental Air** or air expelled from the lungs by the most violent expiration made at the end of an ordinary breath - It varies from 1000 cc to 1500 cc.

(4) **Vital Capacity** or air expired from maximum inflation to maximum deflation and is, therefore, equal to the sum of the Tidal, Complemental and Supplemental Airs. It varies roughly from 3000 cc to 5000 cc.

(5) **Residual Air** or air remaining in the lungs after the fullest expiration. As we shall see later, the Residual air plays an important part in the Collapse Therapy. It includes the so-called dead space and amounts to 1000 cc.

(6) **Total Capacity** or total air held in inflated lungs and is therefore equal to the sum of the Vital Capacity and Residual Air.

Ordinary healthy lung tissue is very elastic and possesses the attributes of expansibility and contractility to the same degree. We have seen that the negative pressure in the pleural cavity varies approximately from -6 mm. Hg. during expiration to -30 mm. Hg., or more, during inspiration. The difference represents the pressure required to overcome the tendency of the expanded lungs to collapse by virtue of their elasticity.

The portions of the lungs which expand most are those in contact with the diaphragm and ribs. The dorsal and mediastinal surfaces and the apex are much less expansile. As the Bronchi and Bronchioles are incapable of expansion, the expansion of the lungs during inspiration is due almost entirely to the enlargement of the infundibula, atria and alveoli.

It was obvious that the limit of the possible enlargement of the thorax, or the Vital Capacity, is influenced by a number of factors, the important ones of which are the volume of the lungs, the flexibility of the thorax and the strength of the respiratory muscles, both normal and accessory. Physical training and indulgence in sport, by deepening the respirations and strengthening the respiratory muscles will, therefore, increase the Vital Capacity.
CHAPTER II.

THE PATHOLOGY OF SPIROMETRY.

It is natural to expect, also, that any diseased condition affecting any of these factors will produce a change in the Vital Capacity.

(1) In incipient Pulmonary Tuberculosis with the advent of the Tubercle Bacilli usually by one of the peri-vascular lymphatics, the fixed cells of the connective tissue and of the endothelium proliferate by way of defence. Leucocytes migrate and accumulate and are destroyed. Lymphocytes then collect and a network of fibres is formed round the invader. Then necrosis occurs at the centre and by way of coagulation a minute caseous mass, "the tubercle," about the size of a pin head, is formed. The bacilli multiply and migrate in the lymphatic currents, the above process is repeated and another tiny tubercle is formed. Later, tubercles coalesce to form a tuberculous nodule.

The effect of this early pathological process on the limit of possible enlargement of the lung will evidently be to diminish it by: -

(a) destroying the alveoli in the affected area and thus reducing the available air space,

(b) attenuating, injuring, or entirely destroying the properties of the elastic fibres in the affected area and thus reducing the flexibility of the thorax. The properties of all elastic tissue are expansibility and contractility. It has been demonstrated that in any infiltrative condition of the lung expansibility is the first to suffer, while the contractility remains more or less intact. Hence there is a tendency for such lung tissue to undergo collapse and the consequent diminution of expansion will be accompanied by a reduction of the Vital Capacity.

(2) In the later stage of the disease, when the infiltrated lung tissue undergoes marked caseation, we would expect the Vital Capacity to be further diminished, due to: -

(a) further replacement of the air-containing alveoli by tuberculous material,

(b) inability of the soft and friable tissue to
enlarge, having lost both its elastic properties.

(3) Still later, as the recuperative process continues, the tissue becomes fibrosed hard and unyielding and tends to contract, retracting the pleura and chest wall and thus further diminishing the Vital Capacity of the lung.

There is yet another factor, a more transient factor than the others, which reduces the Vital Capacity of the lungs, namely, the toxic factor. It is produced by the tubercle bacilli at the local seat of disease. Garvin, Lundsgaard and Van Slyke (1) have shown by means of the gas analysis method of determining lung volume that in early active cases of the disease the reduced Vital Capacity was due to increased Residual Air, and in the moderately advanced stages with marked physical changes the reduction in Vital Capacity was chiefly due to a diminished Total Capacity. This would suggest that in the active phase of the disease the toxaemia produces a change in the walls of the alveoli, impairing their power of retraction so that the Complemental Air is not fully expelled.

Failure to appreciate the importance of the toxic factor on the part of previous workers in Spirometry has led to gross incongruities in results.

Sir Robert Philip, in his modification of the Turban-Gerhardt Scheme of Classification (vide Appendix I), was the first to draw attention to the importance of the toxic factor in clinical classification. It will be my endeavour in the present study, by adopting this scheme of clinical classification, to show the exact relationship between the element of toxaemia and the element of pathological structural tissue change in the reduction of Vital Capacity.
Borelli in 1679 attempted first to investigate the volume of air taken into the lungs. Then within the next 100 years Keill, Thompson, Davy, Goodwin and Kite followed. Little progress was made, for their results were inconsistent. At this we are not surprised since no standard instrument was used and those that were used were not accurate, readings were taken only from a small number of persons, and the size and condition of the body were given little consideration.

During the latter half of the 18th Century much productive study was made of the composition of air, and especially of respired air, by Lavoisier, Priestly, Rutherford and Scheele. It was not till 1846, however, that Spirometry was put on a scientific basis, for in that year Hutchinson (2) placed on record the first accurate investigation of the Vital Capacity of man. In this article he described the Spirometer which he invented himself, and created the terms Vital Capacity, Complemental Air, Reserve (Supplemental) Air, and Tidal Air, enumerating approximate values for each. He gave the results of observations of nearly 3,000 people, some in good health, others suffering from diseases of the lungs. From his observations he deduced that the Vital Capacity of man may be a constant quantity which is directly disturbed or modified by four circumstances, height, weight, age and disease. He concluded that there existed a definite relationship between standing height and Vital Capacity and he laid down the rule that for every inch of height (from 5 ft to 6 ft) 8 additional cubic inches of air at 60° F. are given out by a forced expiration.

Between Vital Capacity and circumference of the chest or stem length he could not find any proportion at all. He took Vital Capacity readings in several cases of Pulmonary Tuberculosis and showed that these cases had a lower Vital Capacity than that which he considered normal, judging by the standing height of the individual.

Criticism of Hutchinson's work.

Looking back over the space of nearly 80 years at the results of Hutchinson's work, we are impressed by the scientific and assiduous manner with which he
collected his vast array of facts. His observations are remarkably accurate, but, as Dreyer has shown, his deductions of the relationship, of which Vital Capacity bears to other body measurements, are arithmetically unsound.

For instance, in arriving at the Vital Capacity for a group, he entirely disregarded the number of individuals in each of the series from which he was making up his groups. He based his comparison of the Vital Capacity of Tubercular subjects on standing heights only, and he did not allow for influence of vocation and previous physical training on Vital Capacity in calculating his theoretical normal.

Hutchinson's pioneer work opened the eyes of the medical world to the probably importance of Vital Capacity as an aid in clinical medicine, and prompted other workers, chiefly in Germany, to make further investigations. During the remainder of the 19th Century, Fabius in Amsterdam, Simon in Gussen, Wintrich in Erlangen, Arnold in Heidelberg, Müller in Gottingen, Waldenberg in Berlin, Cornet in Munich, contributed to the subject without, however, making any noteworthy advance.

It was left to Dreyer to take the next important step forward in the application of Spirometry in Clinical Medicine. In examining recruits for the Royal Flying Corps during the Great War, he found Vital Capacity readings most useful as a quick test in eliminating heart and lung trouble. This encouraged him do look further into the subject. From observations made on 16 individuals, men and boys, varying in age from 13 to 52 years, who were carefully selected on account of their physical fitness, Dreyer has calculated formulae which are alleged to define in a simple manner the association between the several pairs of measurements of the human body and their individual relation to Vital Capacity, viz:-

\[ \frac{W^n}{V.C.} = K_1 \]

where the power \( n \) is approximately 2/3, though more accurately 0.72.

\[ \frac{\lambda^n}{V.C.} = K_2 \]

where the power \( n \) is approximately 2, though more accurately, in males 2.26, in females 2.3.

\[ \frac{Ch^n}{V.C.} = K_3 \]

where the power \( n \) is approximately 2, though more accurately in males 1.97 in females 2.54.

\( W = \) Weight, \( \lambda = \) Stem length. \( Ch = \) circumference of chest.
That is, he proved a definite relationship to exist between Vital Capacity and weight, stem length and circumference of the chest. Based on these formulae, he produced tables as a criterion of physical fitness. He also demonstrated the influence of sex and of occupation and previous physical training on these relationships, making separate tables for each. He considered that, "if a person be found to have as much as 10% less Vital Capacity than is normal for his class, it is probable that he is suffering from some health depressing condition, and if he be found to have as much as 15% below the normal limit, it is practically certain that he is abnormal in this respect."

Having thus attained what he thought to be a normal standard, he applied the data to Pulmonary Tuberculosis in conjunction with Burrell. (1) Computing the theoretical normal from the combined stem and chest measurements they found (1) that there was a definite decrease in Vital Capacity in Pulmonary Tuberculosis (2) that change in Vital Capacity varied directly as the change in the clinical condition during treatment and (3) that the determination of Vital Capacity was useful for the classification of cases of Pulmonary Tuberculosis and as an aid to diagnosis.

Criticism of Dreyer's Work.

(1) His formulae were derived originally from a relatively small number of observations, though their suitability appeared to be confirmed by the results obtained in longer series of data i.e. Hutchinson's and Schuster's to which they are applied. To me the number is too small and totally inadequate to form the basis of any general conclusion or to provide data for calculating a formula of general application. If all human beings corresponded similarly to type and mould like the standard fittings of a motor car, then the formulae would be generally applicable, but a study of anthropology and morphology reveals at once that nature does not conform to type. She produces many "outsizes." The process of selection adopted gives the formula a fictitious degree of accuracy. Insufficient account is taken of the wide range of weight or Vital Capacity found in individuals of similar height, but who are nevertheless normal and healthy.

(2) The values for Vital Capacity are on the whole too low. This has been borne out by Wittrich,
Iyers and Jennings, who working on Dreyer's formulae found that the Vital Capacities were in some of their athletic cases as high as 125% of normal. In such cases, if no previous spirometric reading had been taken, a decrease of 35% by disease would still enable them to be reckoned within the normal 10% margin. In my own series of cases 7 were found to have Vital Capacities greater than normal (Vide p 24). This is another proof of the fact that, if the natural relationships between different measurements of the human body are bound down to a formula, great accuracy cannot be expected.

(3) Then again, Dreyer rightly recognises the difference in Vital Capacity due to vocation and physical training, and to allow for this difference he has placed (13) his tubercular patients in the 3 classes A, B, and C. A glance at this table of classes shows how arbitrary this classification is. With such variation in degrees of fitness and in the different grades of vocation nowadays, it is extremely difficult to estimate the class of the individual. For instance, a male university student with a stem length of, say, 37 inches should have according to the tables a Vital Capacity of 4641cc, if in Class A, or 4237cc, if in Class B, or 3968cc, if in Class C, according to his degree of physical training and participation in sports. We would place the athletic Blue in Class A, but in the case of the large number of students, who don't take part in athletics, what is the criterion of physical fitness? If we place him in Class B, rather than in Class C, we increase his normal Vital Capacity by 6.4%, which is by itself near Dreyer's 10% normal limit. If there is great doubt as to his fitness and he is placed in Class A, instead of Class, C, then his normal Vital Capacity is increased by 14.6%, or almost 15%, the limit beyond which, according to Dreyer, "it is practically certain that the subject is suffering from some health depressing condition."

(5) In their investigation of the 200 tuberculous cases and in correlating physical signs with changes in Vital Capacity, Dreyer and Burrell (11) do not, in my opinion, take sufficient cognisance of the factor of systemic disturbance. In their conclusion they mention relationship between physical change and toxaemia, but they fail to show in the individual cases what this relationship actually is.

(6) In view of the frequent oscillations in a tubercular patient's clinical condition, it is my opinion that more frequent readings than one reading
in 3 - 6 months are necessary to satisfy the general statement that "an improvement in the clinical condition of the patient is found to be accompanied by an increased Vital Capacity, while an advance in the disease results in a decrease in Vital Capacity."

(7) Dreyer and Burrell accepted a theoretical normal calculated from the combined chest and stem measurements. My own experience is that, while the chest measurement of the male can be accurately found, in the female variations in the extent, position and condition of the breasts render accuracy impossible. Lemon and Moersch (14) have already demonstrated this fact. In my own series of females, to allow for the chest discrepancy, I have included a third measurement, namely, surface area.

Notwithstanding the above criticism of Dreyer's work I cannot but express my admiration for the daring originality of his theories and the dogmatic sweep of his claims. He shed a new light on the relation of Spirometry to clinical medicine.

Dreyer's work was the signal for renewed interest in Vital Capacity which had been waning in this country since the death of Hutchinson. Many workers, especially in America, set themselves to test Dreyer's formulae on a large number of cases both in health and disease, and, if possible, to deduce other formulae.

(15) In this country Cameron made a series of observations on sanatorium male tuberculous patients. Calculating his normal Vital Capacity by Dreyer's formulae from the combined stem length and chest measurement, he found that:

(1) the Vital Capacity was reduced in all his cases of Pulmonary Tuberculosis.
(2) the amount of reduction of Vital Capacity, with many exceptions was in proportion to the grade of the disease,
(3) the Vital Capacity during treatment was a valuable index of the progress or retrogression of the disease.

Cameron was unable to find any definite relationship between Vital Capacity and work capacity. He recognised that the toxic factor was a factor important enough to be reckoned with and suspected it to be the upsetting cause in most of his calculations.
Criticism of Cameron's Work.

(1) He did not appreciate the influence which previous vocation and training exert on Vital Capacity, and he assumed that all patients in his Sanatorium belonged to the same class of physical fitness, on the grounds that "they were all drawn from a mixed industrial population."

Now, according to Dreyer's table of classes, A, B, and C, the elements of an ordinary mixed industrial population belong to all 3 classes, viz. blacksmiths and boilermakers in Class A, railwaymen and high grade mechanics in Class B, and shoemakers, printers, potters, tailors etc., in Class C. Moreover, it is difficult to conceive that a mixed industrial population of the present day is without its quota of ex-service army trained men or men who take an active part in sport. I have already emphasised the importance of vocation and previous training on Vital Capacity and I have shown that a difference of about 15% may be produced if they are not taken into account.

(2) In his clinical classification Cameron used the Turban-Gerhardt method, which is based almost entirely on extent of anatomical change. In correlating Vital Capacity with the clinical condition and with work capacity he found many inconsistencies which puzzled him and which he suspected were due to systemic disturbance, but he had no means of definitely gauging its effect.

Wittrich, Myers, and Jennings, in America studied the effect of Pulmonary Tuberculosis on Vital Capacity with a view to confirming Dreyer's researches. They computed the normal Vital Capacity from Dreyer's weight and chest circumference formulae. I shall quote the result of their observations. "From these observations it would appear that Pulmonary Tuberculosis has a definite influence on the Vital Capacity and that the latter decreases in relation to body weight as the disease progresses, being in direct proportion to the amount of disease present. It is also true that as the lung heals and the patient's condition improves there is an increase in Vital Capacity. In other words, the Vital Capacity in its relation to body weight is an absolute measure of a person's physical fitness."

Criticism of the above work of Wittrich, Myers, and Jennings.

(1) The technique is often to much criticism (a) In arriving at the measurement of the stem length they took the sitting height as the patient sat on a chair with a board protruding backward on the seat
and deducted 3% in each case for the effect of the buttock muscles. This must detract from accuracy, for the thickness and condition of the buttock muscles vary a great deal in each person.

(b) In measuring the chest circumference in females "the tape was placed directly on the skin around the chest and at the greatest circumference." I need not further expatiate on the sources of error by this method.

(2) No allowance was made for the effect of physical fitness or vocation.

(3) The general deduction that Vital Capacity decreases in relation to body weight as the disease progresses is open to great doubt, as I hope to show in the succeeding chapters.

(4) The influence of toxic disturbance on Vital Capacity has been discounted. Indeed no mention was even made of it.

Later, Myers(16) alone made a series of observations on the Vital Capacity test in Pulmonary Tuberculosis and also in Bronchial Asthma, Pneumonia and Para-Typhoid Fever. The writer fails to relate in the text what theoretical normal standard was employed. He grouped the cases separately according to X-ray findings and according to physical signs. He found that:

(1) In Pulmonary Tuberculosis the Vital Capacity readings were useful:

(a) in diagnosis,
(b) classification and
(c) as an index of the effect of treatment.

Many cases with signs of non-clinical early, and moderately advanced disease had Vital Capacities within normal limit.

(2) In Bronchial Asthma

(a) Vital Capacity was greatly reduced during an acute attack.
(b) At other times the Vital Capacity was normal in early cases if the chest was free of rhonchi.

(3) In Pneumonia,

(a) there was no other acute disease which reduced the Vital Capacity so much, but
(b) there was no relation between Vital Capacity and extent of the disease.
14.

(4) In Para-typhoid fever, the Vital Capacity of the majority of the cases during the toxic stage, was within normal limits and more than half of these below normal limit had lung or pleural complications.

Criticism of the above work of Myers:

(1) I do not think that it is fair to the Vital Capacity test in Pulmonary Tuberculosis to present to it averages derived separately from physical findings and averages derived separately from X-ray findings, because the clinical aspect of the disease is of the utmost importance and because physical findings and X-ray findings are often very misleading when considered separately and apart from the clinical condition.

(2) No account was taken of the element of toxaemia.

(3) No account was taken of vocation or physical training of the patients, some of whom were of the athletic type. This explains the phenomenon that some patients with physical signs of early or moderately advanced disease showed Vital Capacities above normal.
15.

CHAPTER IV.

THE TECHNIQUE USED IN THE PRESENT SERIES OF EXPERIMENTS.

The general procedure, adopted during the present series of experiments, was as follows:-

1. On the day of admission the patient was subjected to a careful clinical examination and the findings noted in the case sheet. On the same day, or soon afterwards, the Vital Capacity was taken in the manner to be described.

2. At intervals of:

(a) 7 days, the patient's weight was taken by the ward Sister.
It was also my custom every week to compare the patient's work capacity with that of the previous week and to promote or revert him to another work, grade in accordance with Philip's scheme of graduated work (vide Appendix II).
(b) 14 days to a month, the Vital Capacity was again taken.
(c) One month, another careful clinical examination was made and the amount of progress or regression noted.

It is obvious that, if the application of Spirometry to Pulmonary Tuberculosis is to be of value, we will require:-

(A) An accurate normal standard for comparison.
(B) A standardised method and technique, simple and accurate.
(C) An evaluation of various factors which may be expected to influence the Vital Capacity measurement.

(A) THE CHOICE OF A NORMAL STANDARD.

This was a choice requiring much discrimination, since, during the last few years, attempts have been made by many workers, chiefly in America, to arrive at an accurate normal standard by taking measurements of as many normal persons as possible. The results vary greatly and there are nearly as many standards as there are Workers.
I have summarised the principal normal Capacity Standards as follows:-

(1) Standing Height Standard.

This was first used by Hutchinson, who reckoned that it was the only reliable standard. He claimed that the Vital Capacity increased in a simple arithmetical progression with increasing height and he laid down the rule that "for every inch of height (from 5 ft. to 6 ft.) 8 additional cubic inches of air at 60° are given out by a forced expiration." West found standing height standard very useful for quick clinical work and calculated that every centimetre of height was equivalent to a gain of 25cc of air of Vital Capacity in men, and 20cc in women. He did not consider it so accurate as the surface area standard. Bowen and Platt have found those ratios quite satisfactory. Boynton, Shepard, Maeder, Cady, Myer, have already applied them to good sized groups of normal men and women and have obtained satisfactory results. On the other hand, Dreyer showed that Vital Capacity is not a simple function of height, as Hutchinson claimed, since it does not increase at a fixed rate with each unit increase in height, but irregularly.

(2) Sitting Height or Stem Length Standard.

Dreyer found that stem length have a truer relationship to Vital Capacity than height and proved this relationship to be,

\[
\frac{\lambda}{V.C.} = K 3^n
\]

Where \(\lambda\) = stem length in cms.
\(V.C.\) = Vital Capacity in C.C's.

The power n is approx. 2.
K 3 = Constant.

In theory, stem length may bear a more accurate relationship to Vital Capacity, than standing height owing to the:

(a) Varying angle of the femur.
(b) Varying Spinal curvature when standing.
(c) Varying thickness and turgescence of the soft tissues, in the soles.
(d) deformities and defective growths in the leg bones, but Boynton, Rogers, and other observers, after putting standing height and stem length to a practical test, have failed to find any advantage of one over the other. I have to add that in the few cases in which I compared standing height and stem length I found no difference between the two.
17.

(3) Surface Area Standard.

Peabody & Wentworth\(^{(24)}\) first demonstrated the accuracy of Surface Area as a Standard. Later, West\(^{(17)}\) in applying it to a larger number of normal persons, found that "for every square metre of body surface the Vital Capacity increased by 2.5 litres in the case of men, and by 2.0 litres in the case of women." Tables have been devised by Du Bois, Delafield and Du Bois,\(^{(25)}\) which render this method easier to use.

(4) Body Weight Standard

Hutchinson also noted the relation of Vital Capacity to body weight, but concluded that the variations in a normal standard were greater in comparing it to weight than to the standing height. In 1919 Dreyer\(^{(16)}\) presented a formula for obtaining the normal Vital Capacity based on body weight \((\text{vide p. } 8)\). From the results of 12,000 normal persons, whom Myers\(^{(20)}\) measured in the University of Minnesota, he found body surface and body weight to give the most accurate relationship. Edwards and Wilson\(^{(26)}\) found the weight standard most reliable in children.

(5) Chest Circumference Standard,

Dreyer showed in his formulae \((\text{vide p. } 8)\) that Vital Capacity was also a function of the circumference of the chest.

(6) Chest Volume Standard

Garvin, Lundsgaard and Van Slyke\(^{(1)}\) in 1917 concluded that there was a more constant relationship between the Vital Capacity and the chest volume, calculated by measurements of the height, depth and breadth of the chest, than with any of the other Standards which had previously been used.

After much careful consideration I chose as the standard Vital Capacity for my series of observations:

(1) The combined stem length and circumference of the chest in the case of men.
(2) The average of the stem length, circumference of the chest and body surface in the case of women.

These I chose for the following reasons:

The stem length I could measure so as to eliminate
any chances of error - in both male and female. In searching around for another measurement with which to average the stem length, I discarded body weight which, while it may give an accurate estimation of the normal in the healthy, and especially in children, yet in a disease like Pulmonary Tuberculosis, where weight changes so rapidly without any relation to Vital Capacity, (as I shall prove later) a Vital Capacity, definitely abnormal when calculated in relation to normal weight of the person, might appear normal if calculated in relation to the reduced weight during disease. In the case of men I preferred the chest circumference standard to body surface standard (height and weight,) which, though generally speaking is reckoned now to be the most accurate in normal persons, would be less so in Pulmonary Tuberculosis, as it is a multiple of the fallacious factor, body weight.

My reason for choosing the circumference of the chest as the other measurement is that, as there is usually a diminution of chest measurement in phthisical patients as a result of the disease, it probably does not assume too great a degree of original fitness in the average individual examined. In women, owing to the variations in measuring the breasts, amounting sometimes to three inches, the chest measurement cannot be taken as very accurate, notwithstanding strict adherence to a definite technique. I considered it advisable, therefore, to bring in another factor, namely, body surface, to reduce as much as possible unavoidable errors in that direction. Dreyer's tables were used in the case of trunk length and chest circumference as being the best means of taking into account the influence of the variable factors (a) sex, (b) previous physical training and, (c) vocations. A chart constructed from the tables of Du Bois (25) was employed in the case of surface area.

(B) STANDARDISED METHOD AND TECHNIQUE.

I. SPIROMETRY.

A spirometer of the wet type was used, being delicately balanced so that the slightest inspiration on the part of the patient was observed on the scale. The mouth piece was of nickel, easily and rapidly sterilised, and so constructed that it could be firmly held in the mouth without permitting leakage. To eliminate error due to posture (Christie and Beams (29) found that the Vital Capacity when reclining
was 5.5% lower than when sitting) all readings were taken in the standing position with all clothing, except a light undergarment, removed from the chest.

I would lay stress on the value of carefully instructing patients to use the spirometer and to discard initial readings until they are completely familiar with it. Holding the mouth-piece firmly in the mouth with the right hand, the patient was instructed to take the deepest possible inspiration and then to expire at a fairly uniform rate with the thumb and forefinger of the left hand closing the nostril to prevent any possible escape of air down the nose. Leakage about the mouth was easily detected as the nickel became fogged if air escaped from about it. Three to five determinations were made at one sitting and the highest accepted. I found that the children used the spirometer with surprising ease and intelligence. At first they were apt to try too hard and fix the chest holding the breath, so that only the air in the upper passages was expelled, or they were likely to remove the mouth-piece before the chest was empty. Greater discrepancy of Vital Capacity readings was found in the females, due probably to the unfamiliarity of the subjects with the technique of forceful respiration, lack of physical development and unwillingness to co-operate to the extreme of their ability.

II. CLINICAL EXAMINATION.

The cases were classified clinically according to Philip's (30) modification of the Turban-Gerhardt scheme of classification, (vide Appendix I), Philip's method of registering the systemic disturbance being admirably suited to express the exact relation between the amount of pathological physical change and the degree of toxæmia.

Clinical assessment on discharge, or at the end of the period of experiment, was made according to Appendix IV.

The clinical records and the Vital Capacity readings were kept separate to avoid any element of bias in the exact assessment of each.

Doubtful cases from the point of view of physical signs were verified by X-ray when necessary.

My clinical findings of the patients on admission, monthly during the course of the disease, and on discharge or termination of the observations,
were confirmed by the visiting consultants to the Sanatorium.

III. BODY MEASUREMENTS.

(a) Circumference of the chest.

This was found by placing a tape measure in direct contact with the skin.

(i) in males at the nipple-level, i.e. at the level of the fourth intercostal space in the mammary line.

(ii) in females just under the breasts. This level was found to vary considerably on account of the difference in the size, extent and condition of the breasts (vide p 18). While being measured, the patient stood up with the arms hanging loosely by the side and was encouraged to talk so that the measurement obtained was that of the normally breathing chest.

(b) Stem - Length.

This was measured by seating the patient on the floor with the back against a projecting standard graduated in inches. Thereafter the measurement was taken in accordance with Dreyer's method (13): "The subject placed the backs of the fingers upon the floor and with the fingers pointing backwards and the knees fixed, lifted the lower portion of the body gently backwards until the lowest bony portion of the os sacrum was in contact with the front of the measuring standard. The back was then straightened until the back of the head came into contact with the standard. The head was tilted neither up nor down and the eyes looked straight forward. The measurement thus obtained gave the distance between the ischial tuberosities and the top of the head."

(c) Weight.

This was taken at the same time in the evening each week with nothing on except pyjamas in the case of men, and a night dress in the case of women. The weight of these articles (which was fairly constant) was deducted to give the net weight of the body without clothes.
(4) Assessment of Work Capacity.

At the Royal Victoria Hospital graduated work forms an important part of the treatment. The patients pass from the stage of rest to that of graduated activity and then to graduated work, according to Sir Robert Philips's scheme of Physical treatment (vide Appendix II) In the present series the work of the male patients was carefully regulated by me according as the temperature chart, pulse rate, breathlessness, tiredness and other indications suggested.

(C) Evaluation of Other Factors Which May Be Expected to Influence the Vital Capacity Measurement.

(1) Age.

Hutchinson(2) found that the Vital Capacity was greatest at the age of 30 years. Stewart(31) in his series of observations, demonstrated that the Vital Capacity was greatest at the age of 20 years in males and slightly earlier in females. Emerson and Green(32) and Peabody and Wentworth(24) noted a gradual decrease in Vital Capacity after the age of 50 - but Lemon & Moersch(33) proved that this decrease was dependent on the active condition of the person, a man of 70 leading an active life showing little or no reduction.

Generally speaking then, Age does not seem to influence the Vital Capacity of Adults to any marked degree, and, as we would expect from the anatomy and physiology of Spirometry, decrease in Vital Capacity in old age would appear to stand in direct relation to diminution of activity and bodily vigour. In the present series, Case 29, a male, aged 65 is the only case over 50 years of age and as he was in active employment as a miller before admission to the Sanatorium, I did not think it necessary to make any allowance for his age.

(2) Sex.

Fabius(3), Wintrich(5) and Stewart(31) have all pointed out a marked diminution of Vital Capacity of females, as compared with males. Edwards in a series of observations found the Vital Capacity of boys 5% greater than in girls. Myers and Cady(35) proved that sex difference continues up to the greatest ages.
The above resume is merely in agreement with what we would anticipate, arguing from the marked difference in the size of the skeleton and degree of musculature of the thorax between the two sexes. Without a doubt the difference requires separate normal standards. In the present series Dreyer's (13) Sex Standards were adopted.

In the case of Women a few readings were taken during the menstrual period. Menstruation may have some effect but I can find nothing regarding this in the literature.

(3) Spirit of Competition.

I found that the spirit of competition was a factor important enough to be considered in the registering of the Vital Capacity. The process requires an effort, - the Vital Capacity being the greatest amount of air expired after the greatest possible inspiration, and it is only natural to expect that some patients, especially young adult males, would put their whole strength into the test with the view of attaining a higher figure than their neighbours. I could not combat this natural tendency, so that, in order to obtain the maximum effort from every patient, I arranged that the patients should be admitted to the testing room in groups of three or four and open competition was encouraged. I proved that this method gave more uniform results.


I suspected that the loaded stomach after a meal might influence the Vital Capacity by embarrassing the action of the diaphragm. By experimentation I found that the time relation to meals had no influence on the Vital Capacity.

(5) Atmosphere and Temperature Conditions.

Dreyer found that flying at high altitudes decreased the Vital Capacity. As barometric pressure, temperature and water vapour tension each exert a definite influence on air volume, these factors will effect Vital Capacity, but their influence in comparison with the percentage of error in Spirometry (vide p. 48), is so small as to
render them negligible.

No harmful effects were experienced by any of the patients in the taking of the Vital Capacity. This is not really surprising when one considers that the average tubercular patient daily goes through movements such as coughing and defecation in which the intrapulmonary pressure is raised probably just as high. At any rate, it is reasonable to suppose that, if the existing pathological condition was so precarious as to result in harmful effects after forced respiration, the lung tissues would not sustain life for a much greater period. No measurements, of course, were taken after a recent haemoptysis.
Observations were made on a total of 107 patients, of ages ranging from 7 years to 65 years. Of these, 50 were females and 57 were males.

**TABLE I.**  
**SHOWING DIMINUTION OF VITAL CAPACITY IN THE VARIOUS CLINICAL GROUPS OF THE SERIES.**  
V.C. = Vital Capacity.  
(A) Expressed as Numbers.

<table>
<thead>
<tr>
<th>Clinical Group</th>
<th>Number in group</th>
<th>V.C. dim. 0-10%</th>
<th>V.C. dim. 10-20%</th>
<th>V.C. dim. 20-30%</th>
<th>V.C. dim. 30-40%</th>
<th>V.C. dim. 40-50%</th>
<th>V.C. dim. 50-60%</th>
<th>V.C. dim. 60-70%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suspected Pulm. T.B. signs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>indef.</td>
<td>19</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L1</td>
<td>9</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>7</td>
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<td></td>
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<tr>
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<td>16</td>
<td>2</td>
<td>6</td>
<td>5</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L1S</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L2</td>
<td>6</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L2 condemned</td>
<td>31</td>
<td>4</td>
<td>19</td>
<td>8</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>L2S</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L3</td>
<td>1</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L3 condemned</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>L3S</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LS</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**TABLE II.**  
(B) Expressed as percentages of Numbers per group.

<table>
<thead>
<tr>
<th>Clinical Group</th>
<th>Number in group</th>
<th>V.C. dim. 0-10%</th>
<th>V.C. dim. 10-20%</th>
<th>V.C. dim. 20-30%</th>
<th>V.C. dim. 30-40%</th>
<th>V.C. dim. 40-50%</th>
<th>V.C. dim. 50-60%</th>
<th>V.C. dim. 60-70%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suspected Pulm. T.B. signs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>indef.</td>
<td>19</td>
<td>26.3</td>
<td>31.6</td>
<td>26.4</td>
<td>10.5</td>
<td>5.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L1</td>
<td>9</td>
<td>22.2</td>
<td>23.3</td>
<td>44.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L1 condemned</td>
<td>16</td>
<td>56.3</td>
<td>43.7</td>
<td>50.0</td>
<td>50.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L1S</td>
<td>2</td>
<td>83.4</td>
<td>16.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L2</td>
<td>6</td>
<td>12.6</td>
<td>61.2</td>
<td>26.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L2 condemned</td>
<td>31</td>
<td>28.5</td>
<td>57.2</td>
<td>14.3</td>
<td>100.0</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>L2S</td>
<td>7</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L3</td>
<td>1</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L3 condemned</td>
<td>4</td>
<td>50.0</td>
<td></td>
<td>25.0</td>
<td>25.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L3S</td>
<td>10</td>
<td>10.0</td>
<td>10.0</td>
<td>50.0</td>
<td>30.0</td>
<td></td>
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<td>LS</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Tables I. and II. are compiled from the initial Vital Capacities of the 107 cases. The tables are self-explanatory. Their outstanding feature is the manner in which the diminution of Vital Capacity increases as we descend in the clinical group. The figures lie more or less along a straight line from the top left hand corner to the bottom right hand corner of the table.

DISCUSSION OF TABLE I.

(1) VITAL CAPACITY AS AN AID IN DIAGNOSIS.

The Royal Victoria Hospital contains ordinarily a good proportion of doubtful and early cases, so that unique facilities were afforded for testing the diagnostic value of Vital Capacity. At the commencement of the observations 88 of the 107 cases were definite cases of Pulmonary Tuberculosis. The remaining 19 were suspected of having the disease from the symptoms or X rays, but the physical signs revealed nothing definite.

From Table I. we see that, of the 19 cases who were admitted as "observation" Pulmonary Tuberculosis, 5 had Vital Capacities above the computed normal, but less than +10%, 5 had Vital Capacities diminished less than 10%, 5 had Vital Capacities diminished 10-20%, 5 diminished 20-30% and 1 diminished 30-40%. That is, 11 of the 19 cases had Vital Capacities within Dreyer's normal limit of 10%. Of the 5 cases with Vital Capacities above normal (cases 9, 15, 25, 46, 57) all were proved later not to have Pulmonary Tuberculosis. Of the 6 cases with Vital Capacities diminished by less than 10% no evidence of Pulmonary Tuberculosis was discovered during the patient's stay in the sanatorium. 3 of them (cases 20, 80, and 98) had chronic tuberculous disease of the cervical glands, and 1 (case 10) had a recent history of abdominal tuberculosis.

Of the 5 cases with Vital Capacities diminished from 10-20%, 2 (cases 16 and 47) were proved to have chronic bronchitis not associated with Pulmonary Tuberculosis, and 3 (cases 56, 72 and 74) had the diagnosis of Pulmonary Tuberculosis confirmed later.

Of the 2 cases (75 and 105) with Vital Capacities diminished from 20-30%, 1 (case 105) had glandular and abdominal tuberculosis, but both were proved later...
to have Pulmonary Tuberculosis.

The one (case 88) with Vital Capacity diminished from 30-40% was proved to have Pulmonary Tuberculosis a few days after the observations were commenced.

Summing up, we see that of the 11 cases with Vital Capacities within the 10% limit, none were definitely tubercular as regards the lungs, and of the 8 cases with Vital Capacities over the 10% limit, 6 were proved later to have Pulmonary Tuberculosis.

This result compares well with that of Dreyer, Hutchinson and Myers and would suggest that when accurately taken and all influencing factors are taken into account Spirometry is helpful in the diagnosis of doubtful cases.

Differential Diagnosis.

Unfortunately, other diseases of the chest, e.g., acute bronchitis, bronchial asthma, pneumonia, pleurisy etc., produce pathological changes in the lung tissue which result in diminishing the Vital Capacity. Myers[18] Peabody and Wentworth[24] and Stewart[31] have shown this, and in my own series I was able to demonstrate a diminution of Vital Capacity from bronchitis, bronchial asthma and acute fibrinous pleurisy (vide p37)

It must also be remembered that heart diseases also reduce the Vital Capacity of the lungs. Wentworth[24] and Ulrich and Nathanson[26] found that the Vital Capacity closely followed the degree of cardiac impairment, the reduction being due to stasis and enlargement of the capillaries in the walls of the alveoli of the lungs, thus affecting the elasticity and expansibility of the alveolar walls. Compensated heart lesions did not produce a reduction in Vital Capacity. In the present series there was one case with a compensated cardiac lesion, (vide p37). The difficulty of applying Vital Capacity as an aid in the differential diagnosis of chest diseases, therefore, is accentuated by the inter-dependence of the circulatory and respiratory systems.

It is clearly evident that we cannot point to a certain reduction in Vital Capacity as pathognomonic of Pulmonary Tuberculosis.
My observations have convinced me that, when considered with other clinical methods of examination, it is helpful in diagnosis, but considered as an absolute standard it is of little or no value.

THE RELATION BETWEEN VITAL CAPACITY AND CLINICAL CLASSIFICATION.

Tables I. and II. also show the relation of Vital Capacity to anatomical involvement. Generally speaking, the diminution of Vital Capacity varies directly as the anatomical involvement. Most cases in the L1 group lie within the 0-30% diminution columns. All the cases in the L2 group, except two, lie within the diminution columns 10-50%, while all the cases in the L3 group, except three, lie within the diminution columns 30-70%. This is the general result which we expected when discussing the effect of pathological anatomical changes of the lung on Vital Capacity.

The variation, however, of individual cases in the clinical groups L1, L2, and L3 is wide, and a few cases in the same group, as we see from the table differ from each other as much as 40%.

When the systemic disturbance factor is taken into account, according to Sir Robert Philip's scheme of clinical classification, we can confine the variations within narrow limits. For instance, all the cases in the L1S group lie within the diminution columns 10-30% and all the cases in the L1S group lie within the diminution columns 20-40%, and so on. A glance at the figures show that the reduction of Vital Capacity in cases with slight physical changes, but with marked systemic disturbances, may be greater than the diminution of Vital Capacity in cases with marked physical changes but without toxic disturbance, i.e., consistent with a healed lesion. For example, 43.7% of cases in the clinical group L1S showed a reduction of Vital Capacity between 20-30%, while 83.4% of cases in the clinical group L2 had Vital Capacities reduced by only 10-20%, and 50% of cases in the clinical group L3 had Vital Capacities reduced by only 20-30%. This is a definite proof of the effect on Vital Capacity of the "S" factor. A study of individual cases (31, 36, 79, 26, 88, 21, 22, 26, 27, 30, 36, 49, 53, 59, 62, 69, 76, 79, 82, 85, 94 and others) will reveal the part played by systemic disturbances. Each case speaks for itself.
Some cases (22, 30, 31, 53, 59, 69, 76, 85, 94) show clearly a gradual increase in Vital Capacity after the initial temperature and pulse (on admission) have subsided.

Other cases (26, 36, 79, 21, 62) show a sudden fall in Vital Capacity accompanying a relapse or exacerbation of the disease with increase in symptoms and physical signs, i.e., elimination of fresh toxins. Then, as the systemic disturbance subsides, the Vital Capacity rises gradually. In cases 19, 21, and 79, the relapse took the form of an acute attack of dry pleurisy, and no doubt the inability to expand the chest to the full extent, due to the pain, contributed to the fall in Vital Capacity.

The question now naturally arises - may not the systemic disturbance from any acute infection reduce the Vital Capacity? Peabody and Wentworth (27) suspected this. To settle this question, Myers (16) took spirometric readings from a series of 60 cases suffering from an acute infection outside the respiratory tract, namely, Paratyphoid B. fever. Readings were taken during the stage of high fever and weakness. He found that in 85% the Vital Capacity was within normal limits and in more than one half of the remaining 15% the reduction could be explained by lung or pleural complications.

It would appear as if the toxins eliminated from the local focus of Pulmonary Tuberculosis during an exacerbation of the disease impaired the respiratory function either by direct contact on the alveolar walls or reflexly through a nervous inhibition of the respiratory mechanism. The amount of impairment generally corresponds with the degree of toxic disturbance, although scattered throughout the series there are a few exceptions to this. I cannot explain these exceptions.
CHAPTER VI.

VARIATIONS OF VITAL CAPACITY DURING THE COURSE OF TREATMENT.

To find the relation between the Vital Capacity and the changes in the clinical condition of the patients I have divided them into five groups, A, B, C, D, E, according to the length of stay in the Sanatorium. I have also included changes in weight in each residence group with a view of demonstrating whether any parallel exists between Vital Capacity and weight during treatment. The clinical condition of the patients, on discharge from the Sanatorium or on termination of the experiments, has been assessed according to Appendix IV.

TABLE III.
SHOWING VITAL CAPACITY AND WEIGHT CHANGES IN PATIENTS UNDERGOING TREATMENT.

<table>
<thead>
<tr>
<th>Class in Class</th>
<th>Vital Capacity</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average</td>
<td>Greatest</td>
</tr>
<tr>
<td>D.A. (A) For a longer Period than 20 Weeks.</td>
<td>16.5</td>
<td>16.6</td>
</tr>
<tr>
<td>M.I. 3</td>
<td>5.7</td>
<td>10.4</td>
</tr>
<tr>
<td>I. 3</td>
<td>-.6</td>
<td>2.4</td>
</tr>
<tr>
<td>S. 3</td>
<td>-7.7</td>
<td>2.6</td>
</tr>
<tr>
<td>W. 5</td>
<td>10.1</td>
<td>1.6</td>
</tr>
</tbody>
</table>

D.A. (B) For Periods of 16 to 20 Weeks.

| M.I. 2 | 16.3 | 18.3 | 14.4 | 12.3 | 16.5 | 8.1 |
| I. 3 | 10.1 | 13.8 | 6.0 | 21.3 | 40.2 | 3.2 |
| S. 5 | 1.6 | 4.4 | 1.4 | 2.6 | 9.5 | -4 |
| W. 2 | -7.3 | 5.0 | -9.5 | -7 | -7 |

D.A. (C) For Periods of 12 to 16 Weeks.

| M.I. 3 | 11.3 | 12.9 | 9.1 | 15.1 | 19.5 | 12.3 |
| I. 3 | 11.4 | 14.8 | 5.1 | 12.1 | 19.1 | 5.7 |
| S. 1 | 3.7 | 7.1 | -2.1 | 6.6 | 10.0 | 4.3 |
| W. 2 | -2.6 | -2.4 | -2.9 | -2 | 2.2 | 2.1 |
TABLE III. (Contd.)

<table>
<thead>
<tr>
<th>Class</th>
<th>Number in Class</th>
<th>Percentage Change on the Initial Observation</th>
<th>Vital Capacity</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Average</td>
<td>Greatest</td>
</tr>
<tr>
<td>(D)</td>
<td></td>
<td>For Periods of 8 to 12 Weeks.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M.I.</td>
<td>9</td>
<td>12.7</td>
<td>20.5</td>
<td>8.9</td>
</tr>
<tr>
<td>I.</td>
<td>12</td>
<td>3.1</td>
<td>14.6</td>
<td>-16.1</td>
</tr>
<tr>
<td>W.</td>
<td>3</td>
<td>-6.8</td>
<td>4.4</td>
<td>-11.3</td>
</tr>
</tbody>
</table>

Table III is a compound table showing the Vital Capacity and Weight changes in patients undergoing treatment for:

(A) A longer period than 20 weeks.
(B) Periods of 16 to 20 weeks.
(C) Periods of 12 to 16 weeks.
(D) Periods of 8 to 12 weeks.
(E) Period of 4 to 8 weeks.

DISCUSSION OF TABLE III.

(1) RELATION BETWEEN VITAL CAPACITY AND PROGRESS OR RETROGRESSION OF PATIENT'S CLINICAL CONDITION DURING TREATMENT.

A glance at the Vital Capacity columns of Table III reveals the striking fact that the average percentage change in Vital Capacity in all 5 groups, without exception, corresponds closely with the patient's clinical condition i.e. with improvement there is an increase, with retrogression there is a decrease. In the M.I. class, for example, the average percentage changes in the Vital Capacity for the various residence periods A, B, C, D, E, is +16.5,
+16.3, +11.3, +12.7 and +14.5, respectively. In the I class the average percentage changes in the Vital Capacity is +5.7, +10.1, +11.4, +3.1, and +5.2, respectively. In the S class these figures are --6.3, +5.6, +1.3, and +8.5, and in the W class the corresponding values are --7.7, --7.3, --2.6, --6.8, and --6.5.

Reference to individual cases will show more accurately the correlation between Vital Capacity and clinical condition.

Cases 22, 43, 94 and 106 are examples of a steady increase in Vital Capacity going hand in hand with uninterrupted progress.

Cases 63, 64, 65, and 88 exemplify a gradual decrease in Vital Capacity accompanying retrogression of the clinical condition.

Cases 46, 47, 97, 93, 44, 45, 100, 101, and 79 illustrate oscillations in Vital Capacity caused by an unstable clinical state. In these cases the Vital Capacity may rise during one fortnight and fall during the next. They serve to illustrate the fallacy of isolated observations of Vital Capacity. Unless it is observed constantly at regular intervals, a false impression of the patient's progress is readily obtained. The cause of the oscillation of most of these cases can be explained on clinical grounds and a reference to individual case sheets will reveal this. See also Chapter XI.

Another feature of many of the cases, namely, a temporary initial fall of Vital Capacity, during the first fortnight after admission illustrates again, I think, the susceptibility of Vital Capacity to changes in the patient's condition. Cases 28, 29, 33, 77, 83, 100, 101, 107 show this initial fall. I can't explain the phenomenon in no other way than to a temporary deterioration in the patient's condition caused by the sudden change to new conditions.

VITAL CAPACITY AND PROGNOSIS.

We would expect, in view of the intimate association between Vital Capacity and clinical progress, that the latter would be useful in prognosticating the former. This was found to be so in a few of the cases, for example, case 35 and 103.
In case 35 a fall in Vital Capacity after steady uninterrupted progress proved to be of serious prognostic significance for it was the fore-runner of a relapse a few days later initiating a constant decline.

Case 103 merits special mention in this connection. He had been in the Sanatorium several months before this series of observations was begun and had made excellent progress. Well nourished and in excellent condition, he was pointed out to other patients as an example of what Sanatorium treatment could do. A little cough and sputum, however, still persisted. The initial Vital Capacity of 3340cc on August 18th increased to 3400cc on the 8th September, but the subsequent readings on September 22nd and October 6th respectively were 3240cc and 3200cc. He had no temperature and had no apparent increase of symptoms. No activity could be detected in his lungs. He stated that he did not feel quite so well. He was discharged on October 9th as fit for work. On December 22nd he was re-admitted with marked systemic disturbance and a return of the old activity at the left apex. He had gone back to his work but had been forced to give it up a few weeks later.
CHAPTER VII.

RELATION OF VITAL CAPACITY TO WEIGHT.

Reference to the weight columns of Table III shows that the average percentage change of weight coincides generally with the change in clinical condition. A closer examination reveals, however, that marked variations from this general conclusion occur, and that the correspondence of weight with change in clinical conditions is not so accurate as that of Vital Capacity. For instance, note the discrepancy between the average percentage changes of weight and of Vital Capacity in the class I of group B, in the class W of group C and in the class W of group D. A study of individual cases demonstrates conclusively the unreliability of weight, as an index of change in the clinical condition. Cases 27, 35, 36, 45, 57, 77, 79, 92, and 107 illustrate this. To take case 107, this patient was admitted on 20th September with initial weight and Vital Capacity of 6 stone 8 lbs and 2350 cc respectively. In January 1925, when spirometric observations ceased, the weight and Vital Capacity were 9 st. 3 lbs and 2600 cc, respectively, representing an increase of +40.2% in weight and +10.6% in Vital Capacity.

Cases 27, 35, 36, and 70 are examples of weight remaining steady while Vital Capacity decreases.

Case 67 illustrates an increasing weight with steady Vital Capacity.

To any one familiar with Sanatorium patients and his incongruity between Vital Capacity and weight changes is not surprising. The average patient on admission is underweight. The restful life and abundant wholesome food win back in a few weeks the lost weight, and, in addition, give a temporary increase. With a stationary clinical condition and even with one slightly retrogressing weight usually increases under such favourable conditions. No wonder, therefore, that weight and clinical progress are not commensurate with each other. In health, especially with children, weight may be a good index of progress and physical fitness, as Dreyer has demonstrated by his formulae. In Pulmonary Tuberculosis I am convinced that it is entirely unreliable and it was for this reason that I rejected weight as one of my normal standards.
CHAPTER VIII.

Relation of Vital Capacity to Work Capacity.

While supervising the work of my patients in accordance with the Scheme of Physical treatment (vide Appendix II) I could not help noticing in the case of patients, who put their heart and soul into the work, that some became tired and breathless before others, often irrespective of their clinical condition.

I asked myself why. I wondered if there was a relationship between ability to work and Vital Capacity. If so, knowing the Vital Capacity, I might be able to use it as a guide to the amount of exercise that my patients might be expected to take without dyspnoea and tiredness, which are so detrimental to the patients' progress.

Work implies physical exertion and, consequently, an increase of metabolism, which, in turn, requires a greater gaseous exchange. This is met by an increase in the amount of air breathed. In looking round for a measure capable of expressing dyspnoea in terms of Vital Capacity, I found that Sturgis, in 1922, experimenting with 12 normal young men on bicycles, demonstrated that the tendency to dyspnoea during work depended in part at least to the patient's pulmonary reserve or the difference between the amount of air breathed per minute lying quietly at rest and the amount breathed per minute during the greatest exertion or maximum minute volume. He found that a normal man under conditions of greatest exertion and dyspnoea increased his respiratory rate to 35 per minute, while the depths of each respiration amounted to about one-third of his Vital Capacity. i.e. Maximum minute volume = \( \frac{\text{Vital Capacity}}{3} \times 35 \)

while the average minute volume at rest = 5 litres or about one-twelfth of the maximum minute volume. Now, as practically everyone can increase the rate of respiration to about 35 per minute during severe exertion, it is obvious that the fundamental factor which influences the production of dyspnoea is the Vital Capacity of the lungs. Table IV :-
TABLE IV.

Showing the Relation of Work Capacity to Maximum Minute Volume of the Lungs \(\frac{V.C.}{3} \times 35\)

<table>
<thead>
<tr>
<th>Grade of Work attained by Patient.</th>
<th>Number in Grade</th>
<th>Maximum Minute Volume Percentage of Computed Normal Average.</th>
<th>Greatest.</th>
<th>Smallest.</th>
</tr>
</thead>
<tbody>
<tr>
<td>II.</td>
<td>2</td>
<td>50.9</td>
<td>58.5</td>
<td>43.4</td>
</tr>
<tr>
<td>IIIA.</td>
<td>11</td>
<td>64.6</td>
<td>46.4</td>
<td>72.0</td>
</tr>
<tr>
<td>III B.</td>
<td>7</td>
<td>81.9</td>
<td>65.8</td>
<td>89.1</td>
</tr>
<tr>
<td>III C.</td>
<td>9</td>
<td>85.7</td>
<td>92.1</td>
<td>78.1</td>
</tr>
<tr>
<td>III D.</td>
<td>8</td>
<td>93.6</td>
<td>104.6</td>
<td>84.9</td>
</tr>
</tbody>
</table>

Table IV. shows the relation of the grade of work attained by 37 male patients to the computed maximum minute volume of the lungs. Only those male patients were included (1) who had been under treatment and observation for more than 2 months and (2) whose honest desire was to re-attain a degree of active working capacity before discharge. Clinical groups are submerged in these work grades but the latter, as we have seen take the temperature, pulse and general clinical condition into account. Some of the higher work grades include men with L₂ and L₃ lesions (without, of course, any "S" factor.) For instance, the 8 men in grade III D. include two (cases 1 and 39) belonging to the clinical group L₂ and one (case 49) belonging to clinical group L₃. This proves that work capacity depends more on the "S" than on the "L" factor. The average percentage maximum minute volume of the computed normal in respect of grades II, III A, III B, III C, III D, are 50.9, 64.6, 81.9, 85.7 and 93.6, respectively. Note the gradual increase of the averages although the variations of individuals in each grade are rather marked. From experience I consider that 50, 65, 80, 85 and 95 are good working average standards for grades II, III A, III B, III C, and III D, respectively, and will give an approximate indication (other things being equal, heart compensated, etc.,) of the amount of work and exertion which one could expect from a patient without causing dyspnoea and tiredness, when one knows his Vital Capacity.
CHAPTER IX.

INFLUENCE ON VITAL CAPACITY OF OTHER FACTORS AS INTERPRETED FROM VARIOUS CASES SCATTERED THROUGHOUT THE SERIES.

(1) Other chest diseases (from the point of view of differential diagnosis).

(a) Bronchitis.

Two cases in the series (cases 16 and 47) were proved to be suffering from chronic bronchitis not associated with tuberculosis. In the quiescent stage the initial Vital Capacities were $-14.9\%$ and $-12.9\%$ of the computed normal. An acute attack in case 47 reduced the Vital Capacity temporarily to $-26.5\%$ of the normal, due very probably to (i) the presence of mucus in the tubes provoking cough towards the end of expiration and thus preventing complete expiration, (ii) increased systemic disturbance.

(b) Bronchial Asthma.

Case 93 was subject to attacks of bronchial asthma. On one occasion her Vital Capacity was taken during an attack and showed a percentage reduction of $-47.7\%$.

(c) Acute Fibrinous Pleurisy.

Cases 21 and 79 had an attack of acute fibrinous pleurisy with considerable systemic disturbance. The percentage reduction in Vital Capacity caused by the attack was $-14.1\%$ and $-9.1\%$. Inability to expand the chest fully during inspiration and the toxic disturbance are probably the influencing factors here.

(d) Old thickened Pleura.

Cases 49 and 54 are examples of this, but the parenchymatous changes below the pleura prevented any estimate of the effect of the pleura on Vital Capacity from being made. Theoretically, it should reduce the Vital Capacity.
The numbers quoted above are, of course, far too small to warrant definite conclusion, but it seems evident that little or no help in the differential diagnosis of Pulmonary Tuberculosis from other chest diseases can be afforded by Vital Capacity apart from physical signs. This question has already been discussed (vide p26).

(2) Compensated Heart Lesion.

Case 21 had a murmur of mitral incompetence, but he showed neither signs nor symptoms of heart decompensation. He belonged to clinical group L2, his initial Vital Capacity reading being -21.3% of the theoretical normal, which is about normal for that group, suggesting that his compensated heart lesion did not further affect the Vital Capacity. (vide p26)

(3) Pregnancy.

When the series of observations was commenced case 87 was 3 months pregnant. As reference to the case sheet will show, distension of the abdomen did not appreciably affect the spirometric readings. Theoretically, I had expected a reduction on the assumption that the downward descent of the diaphragm would be impeded by the increased fullness of the abdomen. I cannot explain why the Vital Capacity should not be diminished unless it be due to gradual adaptability of the abdominal wall by enlarging to accommodate the growing foetus without altering the intra-abdominal pressure. Wittrich, Myers and Jennings(12) found little or no effect on Vital Capacity from pregnancy and Lemon and Moersh(33) experimenting on 7 women with large fibroids and cystic ovaries, found the change in Vital Capacity to vary as much as +9.2% to -23.2%.
CHAPTER X.

THE SIGNIFICANCE OF VITAL CAPACITY IN THE TREATMENT OF PULMONARY TUBERCULOSIS BY ARTIFICIAL PNEUMOTHORAX.

Treatment by Artificial Pneumothorax was performed on five cases of the present series, (cases 68, 88, 90, 91, and 96), but I was able to study carefully the effect of a complete series of insufflations in only two of them.

Literature.

On looking up the literature on the subject, the only reference I could find regarding Vital Capacity and Artificial Pneumothorax was that by Myers (16) who on taking the Vital Capacity readings of a few patients treated by Pneumothorax, found it diminished by about 50% of the normal.

Technique.

The ordinary type of Pneumothorax apparatus for injecting filtered air was employed, the inspiratory and expiratory intra-pleural pressures being registered on a water manometer. The needle used for the initial insufflation was that of trochar and cannula with an internal bore of about 1.2 m.m. A sharp pointed needle of about 0.6 m.m. bore was used for refills. Spirometric readings were taken before and after each insufflation without any deleterious effect to the patient.

The results obtained are interesting, some of them being contrary to my expectations. Before discussing them it would be well for their proper understanding to investigate the rationale and physics of Artificial Pneumothorax.

The Rationale of Artificial Pneumothorax.

The rationale, advocated originally by James Carson of Liverpool as far back as 1821, consists in giving the diseased lung rest by collapsing it temporarily and driving out the pathologic secretions from the cavities and tubes. At first the practice was to introduce enough air to compress the whole lung completely. Now, experience has taught us that the aim is rather to collapse the diseased areas only, allowing the unaffected part of the lung to
function. It is important to obtain just this degree of collapse if success is to be attained. Clinical findings and X-rays can give valuable information during treatment, but they tell little of the physiological function of the lungs. It was with the view of possibly acquiring additional information re the state of the treated lung that spirometry was applied in this series.

The Physics of treatment by Artificial Pneumothorax.

I thought at first that the question of variation of Vital Capacity during treatment by Artificial Pneumothorax would be a simple one, for I reasoned thus:-- "A diseased lung A, composed to a large extent of elastic tissue and possessing various degrees of expansion and contraction according to the extent of the disease, is kept in a state of expansion and retraction by the play of difference of pressures on its surfaces. Before insufflation it has a Vital Capacity X. After insufflation the range of surface pressures is altered and the lung will adapt itself to this change by driving out more air and reduce its Vital Capacity pari passu with the amount of air insufflated." This was not the case, however, and at first the change in Vital Capacity appeared to bear no relation whatever to the amount of air insufflated (see Table VI).

On studying more closely the physics of the chest many factors were discovered to account more or less for the discrepancies. The chief of these are:

1. The degree of collapse of the treated lung.
2. Physical laws governing the relationship of the newly established pressures.
3. Residual air.

In Chapt. I in discussing the anatomy and physiology of the Chest, I referred to the thorax as a completely closed box in which the two antagonistic forces, the positive intrapulmonary pressure and the negative extrapulmonary pressure, keep the elastic tissue of the lung from being collapsed. When air is gradually introduced into the pleural cavity, the inter-relationship of
those two pressures alters in proportion to the amount introduced.

In this changing relationship there are three distinct stages, which have an important bearing on the physics of Pneumothorax treatment, viz:—

Stage 1. I.e. when the intra-pleural pressure is much smaller than the intra-pulmonary pressure. As the elastic tissue of the lung is relaxed but not compressed the lung can still expand and contract to a limited extent on inspiration and expiration. This is the degree arrived at on ordinary treatment. Cases 68 and 90 were of this type. Periodic screening by X-ray showed that the undiseased portion of the treated lung expanded and retracted more or less with each respiratory phase.

Stage 2, is a transitional stage and is that reached when, by greater insufflations of air, the intra-pleural pressure just equals the intra-pulmonary pressure, that is, both are at atmospheric pressure. The lung is collapsed by virtue of its own elasticity.

Stage 3, i.e. where by still greater insufflations both the inspiratory and expiratory intra-pleural pressures exceed atmospheric pressure or intra-pulmonary pressure. The whole lung will be compressed and rendered ultimately solid when the air remaining inside is gradually absorbed. It is obvious that, unless the mediastinal barrier gives way, any further insufflation of air will leave the Vital Capacity unaltered. This degree of collapse is now rarely attained, except, say, to compress an active and fibrosed cavity or to occlude an eroding blood vessel.

There is another type which is sometimes unwillingly produced in collapse therapy - namely, the type where, due to strong pleural adhesions a small pocket of air is formed. Cases 96 and 88 are examples of this.

It will thus be readily understood that the resultant change in the Vital Capacity after an insufflation will depend on the stage of collapse of the treated lung.

(2) Residual Air,

This, as we have noted in Chapt. I, is the air left in the lungs after the most forcible
expiration, for the simple reason that the thoracic cavity, against which with its air the lung is continually pressing during respiration, cannot further reduce itself owing to a certain degree of rigidity in its walls. We have also seen that the residual air plus the Vital Capacity make up the total capacity of the lungs, so that, as the volume of the thoracic cavity is constant during each phase of inspiration, we would expect a definite relationship to exist between change of residual air and Vital Capacity, other things being equal. When air is introduced into the pleural cavity, both the inspiratory and the expiratory intra-pleural pressures are naturally increased. The increase in inspiratory intra-pleural must reduce the complemental air and, therefore, the Vital Capacity, and we might expect that reduction would be equal to the amount of air introduced. But, as the expiratory intra-pleural pressure is also increased, the lung is compressed more during expiration and drives out not only the complemental air, but also part of the residual air thus reducing the Vital Capacity. We have thus two diametrically opposite forces coming into play, as far as the Vital Capacity is concerned, when air is introduced into the pleural cavity.

The change in Vital Capacity will be the resultant between these two values thus -

\[ V.C.1 = V.C. - (\text{Decrease in \ complemental air} + \text{Increase derived from Residual air}) \]

where \( V.C.1 \) = new Vital Capacity.

and \( V.C. \) = original Vital Capacity.

The change in Vital Capacity is thus dependent on the law in Physics governing the difference of pressure between two gases - i.e. between

(1) the intral-pulmonary air at atmospheric pressure.

(2) the intra-pleural air, of which the pressure at the inspiratory stage is normally about - 20 m.m. Hg, and the pressure at the expiratory stage is normally about - 6 m.m. Hg.

Decrease of complemental air will vary directly as the difference between atmospheric and inspiratory intra-pleural pressures.
When inspiratory intra-pleural pressure, as registered on the Water Manometer, is zero, i.e. atmospheric pressure, there will be no complemental air.

Increase of residual air will vary directly as the difference between the expiratory intra-pleural pressure, as registered on the Water Manometer, and atmospheric pressure up to the limit, of course, when all the residual air is expelled - that is, when the lung is completely collapsed.

Let us now examine case 68, Table VI in the light of this reasoning. Since admission she had gradually been going downhill e.g. temperature ranging 97° to 101° despite complete rest in bed. (see case sheet)

**TABLE V.**

SHOWING THE VITAL CAPACITIES AND THE INTRA-PLEURAL PRESSURES OF CASE 68, BEFORE AND AFTER EACH INSUFFLATION.

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1950</td>
<td>300</td>
<td>-16 - 6 -10 -2</td>
<td>1570</td>
<td>-380</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>1780</td>
<td>450</td>
<td>-13 - 6 -8 ± 0</td>
<td>1280</td>
<td>-500</td>
</tr>
<tr>
<td>3</td>
<td>14</td>
<td>1820</td>
<td>650</td>
<td>-12 - 4 - 4 + 4</td>
<td>1300</td>
<td>-520</td>
</tr>
<tr>
<td>4</td>
<td>23</td>
<td>1650</td>
<td>700</td>
<td>-12 - 4 - 7 + 4</td>
<td>1230</td>
<td>-450</td>
</tr>
<tr>
<td>5</td>
<td>48</td>
<td>1650</td>
<td>700</td>
<td>-14 - 8 - 6 + 3</td>
<td>1270</td>
<td>-450</td>
</tr>
<tr>
<td>6</td>
<td>65</td>
<td>1520</td>
<td>800</td>
<td>-14 - 7 - 7 + 3</td>
<td>1270</td>
<td>-410</td>
</tr>
<tr>
<td>7</td>
<td>79</td>
<td>1700</td>
<td>800</td>
<td>-12 - 5 - 6 + 2</td>
<td>1300</td>
<td>-400</td>
</tr>
<tr>
<td>8</td>
<td>93</td>
<td>1780</td>
<td>800</td>
<td>-10 - 6 - 7 + 3</td>
<td>1300</td>
<td>-390</td>
</tr>
<tr>
<td>9</td>
<td>114</td>
<td>1700</td>
<td>800</td>
<td>-15 - 7 - 4 + 4</td>
<td>1010</td>
<td>-690</td>
</tr>
<tr>
<td>10</td>
<td>132</td>
<td>1650</td>
<td>800</td>
<td>-16 - 8 - 4 + 1</td>
<td>1070</td>
<td>-580</td>
</tr>
</tbody>
</table>

On the initial insufflation of 300 cc, the inspiratory intra-pleural pressure rose from -16 to -10, so that the amount of complemental air was moderately reduced. The expiratory intra-pleural pressure was increased to -2, which is still below atmospheric pressure and, therefore, no residual air was displaced to increase the Vital Capacity. A marked reduction in Vital Capacity of 380cc, was the result.
After the insufflation of 450 cc, on the second day of treatment the inspiratory intra-pleural pressure rose to -8 but the expiratory intra-pleural pressure rose to 40. In this case, again the complemental air was reduced and there was still no increase of residual air. The change in Vital Capacity was -500 cc. The temperature had now become more stable and the toxic symptoms had gradually subsided.

In the third insufflation the inspiratory intra-pleural pressure rose to -4 thus reducing the Vital Capacity, but the expiratory intra-pleural pressure rose to +4, so that some residual air was expelled to increase the Vital Capacity. The resultant change in Vital Capacity was 520 cc, or less than the amount of air insufflated.

Insufflations 4 to 8 show the same phenomena as the third one. Note how the reduction in Vital Capacity showed a gradual decrease, which was coincident with improvement in her general condition. During the Pneumothorax treatment she was repeatedly screened by X-ray which showed gradual collapse of the treated lung to about half its extent and showed expansion and retraction with each respiratory phase. After the eighth insufflation she took a turn for the worse and temperature again rose, due for some reason or other to exacerbation of the disease. The Vital Capacity diminished greatly. At this point observations had to be abandoned.

Case 90 did not at first improve so quickly under Pneumothorax treatment as the previous one. Her's was an old standing fibroid condition with a history dating back to 1913. The Spirometric and pressure readings are as under:

### TABLE VI

**SHOWING THE VITAL CAPACITIES AND THE INTRA-PLEURAL PRESSURES OF CASE 90, BEFORE AND AFTER EACH INSUFFLATION.**

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1950</td>
<td>600</td>
<td>-16 - 8 - 5</td>
<td>1110</td>
<td>- 840</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>1350</td>
<td>450</td>
<td>-10 - 6 - 8</td>
<td>1080</td>
<td>- 400</td>
</tr>
<tr>
<td>3</td>
<td>28</td>
<td>1750</td>
<td>1000</td>
<td>-12 - 6 - 4</td>
<td>980</td>
<td>- 720</td>
</tr>
</tbody>
</table>
The first insufflation of 600 cc, of air produced a marked fall in Vital Capacity, namely, - 840 cc, due in large measure to the great increase in the inspiratory intra-pleural pressure, so that the quota of complemental air towards the Vital Capacity was very small and the small amount of residual air expelled (by the expiratory intra-pleural pressure rising to +2) added comparatively little to the Vital Capacity. The toxic disturbance would also doubtless contribute towards the marked fall.

A second insufflation of 450 cc, failed to bring the temperature down and it was not until a third insufflation of 1000 cc, that the toxic symptoms abated. The changes in Vital Capacity, 400 cc, and 720 cc, produced by the 2nd and 3rd insufflations respectively, are less marked than in the first insufflation.

These changes in Vital Capacity can be explained by the same physical factors which governed the changes in Insufflations 4 to 8 of the previous case.

In my opinion the following inferences may be drawn from this case, viz: -

(a) It is probable that the delay in the abatement of toxemia as compared with the previous case was due to the need for greater pressure in view of the fibroid nature of the condition. This would constitute a plea for Pneumothorax treatment being begun at a comparatively early stage of the disease before fibrosis is marked.

(b) The third insufflation brought the Vital Capacity down to 980 cc, a Vital Capacity which in an ordinary Tubercular case would cause much cyanosis and orthopnoea. Yet here the patient showed very little trace of it. In the discussion under Working Capacity we saw that dyspnoea was due in a large measure to a deficient Pulmonary ventilation (other things being equal) and the explanation of the lack of dyspnoea in Pneumothorax cases might be that the portion of the residual air expelled functions as tidal air and thus helps to increase the Pulmonary ventilation.

Part played by the Mediastinum.

Graham (38) experimenting with dogs proved that the mediastinum in these animals is labile and
offers communication from one hemi-thorax to another. He adds that the same must be true of men also. Observations of other writers dispute this assertion. In my own cases there were no symptoms nor signs nor evidence from the Vital Capacity that the mediastinum was labile under ordinary artificial Pneumo-thorax pressures. (Case 88, who had a spontaneous Pneumo-thorax showed marked signs of displacement of the mediastinum, but it is almost certain that under such sudden increase of pressure any mediastinum would be displaced). It will readily be understood that a lot will depend on the fact whether the mediastinum is labile or rigid. If rigid, it will not deflect and insufflation will not therefore interfere with the other lung; if labile every sufflation to the treated lung will, by deflecting the mediastinum, encroach upon the alveoli of the contra-lateral lung and reduce its available air space. The third stage of collapse would naturally be impossible with a labile mediastinum.

The cardio-vascular factor in treatment by Pneumo Thorax.

In searching for other causes which might influence the changes in Vital Capacity during Pneumo-thorax we must take the cardio vascular system. Mention has already been made of the intimate inter-relationship between the circulatory and respiratory systems (p 26). By collapsing the alveolar walls the tiny capillaries are flattened or entirely occluded. The heart must endeavour to maintain the usual aeration of the blood and increases its output by contracting the right ventricle. If the heart cannot compensate the right heart dilates, stasis of the pulmonary circulation results, the engorged capillaries protrude into the lumen of the alveoli thus obviously reducing the Vital Capacity. In my Pneumo-thorax cases the heart however, managed to compensate so that this question need not be considered.

Relation between Pleural effusion and Vital Capacity.

An opportunity presented itself of studying the effect of a pleural effusion on Vital Capacity. On June 21st, Case 91 developed pleurisy with effusion on the left side. After the eighth refill in course of treatment by artificial Pneumo-thorax the fluid
showed no sign of absorption. On August 13th X-rays revealed its level to be at the 4th rib and the left lung to be almost completely collapsed. It was decided to aspirate fluid and replace by air. This was done on August 14th. The Vital Capacity readings are tabulated below:

<table>
<thead>
<tr>
<th></th>
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<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Vital Capacity</td>
<td>1450</td>
<td>Operation</td>
<td>1480</td>
<td>1520</td>
<td>1580</td>
<td>1600</td>
<td>1650</td>
<td>1650</td>
<td>1720</td>
<td>1630</td>
</tr>
</tbody>
</table>

Note the gradual rise in the Vital Capacity, beginning almost at once after the replacement by air and lasting for about a month by which time the fluid had again accumulated.

The result here would suggest that, (1) while it is certain from pathology that the effect of prolonged intra-pleural pressure will ultimately result in producing a permanent collapse due to organisation and fibrosis in the collapsed lung, a period of 7 weeks is insufficient to cause permanent damage.

(2) Air being more compressible than fluid and more evenly distributed in the pleural cavity a lung previously compressed by fluid will gradually re-expand on replacement by air, provided no permanent loss of expansile quality of the lung has taken place. This would suggest that in every way air as a collapsing agent is superior to fluid, being easier to manage. In addition, air exerts a more equal pressure and is absorbed more quickly than fluid.

In case 96 treatment by artificial Pneumothorax was instituted with the view of stopping haemoptysis. Three attempts were made to insufflate at different sites but due to the pleural adhesions a pocket was entered in each case. In one of these cases a few cc, produced a positive pressure of +20 m.m. Hg. As was expected, this localised high pressure did not produce any change in the patient's Vital Capacity.

In case 88 pleural adhesions resisted two efforts to enter the left pleural cavity and the attempt was abandoned. A week later, the patient
developed signs and symptoms of a spontaneous Pneumothorax of the left lung. The apex beat was displaced as far as the right mammary line proving that under great pressure the mediastinum may become displaced. The Vital Capacity fell from 1900 to 950 denoting embarrassment also of the healthy lung. Cyanosis and orthopnoea were present for the first few days only. The patient was discharged soon afterwards.
CHAPTER XI.

GENERAL DISCUSSION ON THE ACCURACY OF THE RESULTS ON THE PRACTICAL APPLICATION OF SPIROMETRY IN PULMONARY TUBERCULOSIS.

Notwithstanding the greatest care in technique and after allowance has been made for extraneous influences, it is evident, on glancing through the results, that they are not very accurate. They fit well into groups or classes from which valuable generalisations can be made, but in each group or class the individual results often differ considerably one from the other.

On investigating the causes of this lack of scientific inaccuracy, I attribute them to be:

(1) Impossibility of establishing an accurate theoretical normal standard on account of the variations in human measurements (vide p 9).

Cases 9, 32, 34, 46, 47, show Vital Capacities considerably above normal, amounting in case 57, to 11.2%. Of these cases 32, and 34 belong definitely to the L2 clinical group. All were cases of individuals who had taken an active part in sport and exercise. Myers sometimes found that his athletic subjects had Vital Capacities as much as 125% of normal (vide p 14). Such individuals may have a considerable reduction in Vital Capacity due to disease and yet fall within the physiological normal.

(2) Inability to gauge with scientific exactitude the amount of reduction to be made for systemic disturbance produced by the tuberculous lesion (vide p 27).

(3) Unavoidable error in taking the Spirometric reading. In my opinion this is due not to the method but to the inability of the subject to reach the same point in inspiration or expiration, or both, each time. This is, I think, more marked in the case of inspiration, the last part of which is due to the diaphragm. Pratt (41) found that the Vital Capacity varied considerably in the same person over long periods of time. The cause of variation is probably an intricate one. Haldane (39) and Lindhard (40) have recently demonstrated the influence of light, temperature, ingestion etc., on the physiology of
respiration, and Vital Capacity is nothing more than a part of this intricate mechanism.

On discussing the relation of Vital Capacity to the changes in the patient's clinical condition during treatment, I drew attention to the greater degree of accuracy attained, compared with that of other results. This was chiefly due to the existence of a previous reading for comparative purposes. This fact should guide us in the question of the practical application of Spirometry to Pulmonary Tuberculosis.

Practical Applicability of Spirometry to Pulmonary Tuberculosis.

Spirometry will prove to be of most service in clinical medicine in cases where serial readings of the individual during health have previously been taken. This will dispense with the need of a theoretical normal standard and will eliminate any fallacy which might be introduced thereby.

I am of the opinion that General Practitioners, School Medical Officers, Factory Surgeons, and Insurance Doctors, would find Spirometry very useful in their particular spheres in the primary diagnosis and treatment of Pulmonary Tuberculosis, provided that they made it a routine to procure the Vital Capacity of the patient in health before hand.

To the Physician in charge of a Sanatorium or, indeed, to any Doctor with Tuberculous patients under his care, the spirometer should be invaluable as an aid -

(a) in the diagnosis of doubtful cases,
(b) in estimating the extent of pulmonary involvement,
(c) in estimating the degree of activity of the disease,
(d) in prognosis,
(e) in estimating how much work any patient can reasonably be expected to do without producing dyspnoea and tiredness, and
(f) as an index of treatment, including treatment by Artificial Pneumothorax.

In treatment by Artificial Pneumothorax, while the symptoms may indicate to the activity of the disease and the physical signs may reveal the amount of structural change, Spirometry is the only method
capable of registering changes in the functional capacity of the lungs. As I have demonstrated in Chapter X, such information, by throwing valuable light on the degree of collapse and on the recuperative ability of the lung after each insufflation, can give valuable aid in foretelling success or failure and in estimating the amount of future insufflations.

But, as I would emphasize again, Vital Capacity should never be regarded as an absolute standard. Like many another "scientific" test Spirometry must never be considered as more than a valuable adjuvant to the ordinary methods of careful clinical observation and examination, concerning which, Sydenham, as quoted by Sir Dyce Duckworth in his Inaugural Address on "The Relation of Art to Modern Medicine" delivered to the Royal Medical Society, has so aptly put it, "True Practice consists in the observations of Nature; these are finer than any speculations. Hence the medicine of nature is more refined than the medicine of philosophy."
CHAPTER XII.

SUMMARY AND CONCLUSIONS.

SUMMARY.

(1) In endeavouring to find a method capable of detecting the minute pathological changes of incipient Pulmonary Tuberculosis, and of recording the smallest alterations in lung structure during the treatment of the disease, the science of Spirometry was applied to 107 Sanatorium patients of both sexes and of ages ranging from 7 to 65 years.

(2) A special effort was made to estimate precisely the effect of systemic disturbance on Vital Capacity.

(3) Five patients were treated by Artificial Pneumothorax and it was thought that by regulating the amount of air insufflated and thus controlling at will the extent of tissue change, further facilities would be afforded of examining the relation between anatomical change and Vital Capacity.

(4) The writings of previous workers on the subject of Vital Capacity were examined and criticised.

(5) After much careful consideration a theoretical normal was computed, and a technique was elaborated, which, by taking into account important extraneous influences, was calculated to reduce the element of error to the lowest minimum.

CONCLUSIONS.

(1) I cannot assert that the quest after my ideal has been successful, despite the most careful attention to detail and technique my results indicate that Spirometry is not an exact science. I attribute the inaccuracy to:—

(a) impossibility of establishing a theoretical normal standard applicable to all humans.

(b) inability to estimate with scientific
exactitude the amount of reduction to be made for the systemic disturbance produced by the tuberculous lesion.

(c) Uncontrollable errors in taking the spirometric reading.

(2) If Vital Capacity is not an absolute standard per se, it can, if properly interpreted in conjunction with the clinical condition be very useful in the diagnosis, prognosis and treatment of the disease. Proper interpretation depends on appreciation of the relative parts played by two factors in the reduction of the Vital Capacity, namely, (a) the factor of pathological structural tissue change, (b) the factor of systemic disturbance. By adopting a scheme of clinical classification which takes cognisance of the changing relation between these two factors, I have demonstrated their exact inter-relationship in the changes of Vital Capacity. Neglect of the "S" factor in applying Spirometry to Pulmonary Tuberculosis deprives the Vital Capacity readings of most of their value and has been responsible for the inconsistency of the findings of previous workers.

(3) Diagnosis. I found a reduction of Vital Capacity in all my cases of Pulmonary Tuberculosis except two. These exceptions in patients who were of the athletic type were due to the theoretical normal being too low, even though allowance had been made in the latter for influence of previous physical training and vocation. I have shown that without the aid of clinical findings the value of Spirometry in the differential diagnosis of other diseases of the chest is negligible.

(4) Stage of the Disease. The Vital Capacity stood in direct relation to the severity of the anatomical lesion and to the amount of the systemic disturbance. Generally speaking, in the early case the latter exerted most influence on Vital Capacity; in the more advanced cases with marked physical changes, the former was the most important factor.

(5) Course of Treatment. I have demonstrated that a most intimate relation existed between Vital Capacity and the variations in the patient's clinical condition during treatment. In this respect Vital Capacity formed a much truer index
than weight. With clinical progress the Vital Capacity increased without exception. A slowly increasing Vital Capacity always prognosticated steady clinical improvement. An oscillating Vital Capacity always denoted an unstable clinical state with doubtful prog-nosis. A decreasing Vital Capacity was always accompanied by a steady decline. A sudden fall in Vital Capacity was usually indicative of a febrile attack in some part of the respiratory tract - e.g. acute pleurisy or associated acute bronchitis or a sudden exacer-bation of the disease.

(6) Work Capacity. By expressing Vital Capacity in terms of percentage of maximum minute volume \( \times 35 \) (which is a measure of the liability of the patient to dyspnoea), I have been able to show that Vital Capacity varied directly as the capacity of the patient for work, where the latter was assessed in Work Grades according to clinical manifestations. I have deduced percentage values of maximum minute volume for each grade of Work from careful observations on 37 selected men of all grades. A knowledge of these values, should enable an estimate to be made, other things being equal, of how far the patient's metabolism can safely be increased by work without causing dyspnoea and tiredness.

(7) Treatment by Artificial Pneumothorax. Although my series of Pneumothorax cases is small, I consider that my observations on the changes of Vital Capacity during treatment by Artificial Pneumothorax would suggest the following conclusions:—

(a) The apparent discrepancy between the amount of an insufflated and the resultant changes in Vital Capacity can be explained by ordinary physical laws when these are applied to the newly formed intra-pleural pressures as registered on the manometer and when other factors i.e. (a) residual air (b) mobility of the mediastinum, (c) condition of the treated lung, (d) condition of the cardio-vascular system, are taken into account.

(b) I would submit that this relation is constant enough to enable the Vital Capacity to be used as an index of success or failure during treatment and as a guide in regulating the amount of future insufflations.
(c) In cases 68 and 90 a steady increase of Vital Capacity during treatment was consistent with successful recuperation of the treated lung, and is, in my opinion, the ideal to be aimed at in treatment.

(d) A patient under treatment by Artificial Pneumothorax can withstand a greater reduction of Vital Capacity, without showing cyanosis, than the ordinary tuberculous patient.

(e) While it is certain that the effect of prolonged intra-pleural pressure by fluid will ultimately result in producing a permanent collapse, pressure for a period of 7 weeks by fluid up to the 4th Rib was found insufficient to produce permanent collapse.

(f) Spirometry has shown that the practice of substituting air for fluid in cases of pleural effusion following Artificial Pneumo-thorax is to be recommended.

(g) The high pressure produced when a pleural pocket is entered has no influence on the Vital Capacity of the lungs.

(8) **Practical Application of Spirometry in Pulmonary Tuberculosis.** My conclusions in this respect have been summarised already at the end of the previous chapter.

(9) No ill effects to the patients from insufflating were noticed during the investigations.
REFERENCES.


(4) Simon, G:— Aber die Menge der Ausgethmeten Luft bei Verschiedenen Menschen. Gussen 1848.


(30) Philip, Sir R.: Tuberculosis from the Standpoint of Preventive Medicine, Dictionary of Practical Medicine, III, 382.


58.


APPENDIX I.

SCHEME OF CLINICAL CLASSIFICATION (Philip).

Extract (30)

To be of scientific and practical value, clinical classification must include an estimate of the amount of anatomical involvement and also of the degree of systemic disturbance.

The symbol L represents the local or lung lesion, and the symbol S the systemic disturbance. For convenience the three anatomical stages of the Turban-Gerhardt Classification already referred to are accepted and described as L1, L2, and L3. By the simple device of combining variously capital and small letters, the diagnosis at a given time can be expressed with reasonable accuracy. Thus, in case of a limited involvement of the lung, the various possibilities may be stated as L1 = a slight local process without systemic disturbance, or L1S = a slight local process with relatively slight systemic disturbance, or L1S = a slight local process with equivalent systemic disturbance, or L1S = a slight local process with excessive systemic disturbance. It matters not what amount of local lung involvement exists, whether L1, or L2, or L3, the same principle of classification is available.

Practical experience has shown the value of such a system. It has not merely a value in relation to diagnosis at a given moment, but affords a most serviceable means of recording the changes which occur from time to time in such cases, whether in the direction of improvement or the reverse.

The following Table shows the scheme of classification and the symbols in use:

<table>
<thead>
<tr>
<th>L1</th>
<th>L1S</th>
<th>L1S</th>
<th>L1S</th>
</tr>
</thead>
<tbody>
<tr>
<td>L2</td>
<td>L2S</td>
<td>L2S</td>
<td>L2S</td>
</tr>
<tr>
<td>L3</td>
<td>L3S</td>
<td>L3S</td>
<td>L3S</td>
</tr>
</tbody>
</table>

The presence of complications is indicated by the symbol + followed by a reference to the lesion, e.g. L2S + ent. tub., indicates a case of extensive lung involvement (vomica formation) and excessive systemic intoxication, along with intestinal tuberculosis.
APPENDIX II.

SCHEME OF PHYSICAL TREATMENT AT SANATORIUM. (Philip).

The following scheme of physical treatment is used at the Royal Victoria Hospital for Consumption. It is arranged in graduated stages.

I. RESTING STAGE.

On Admission to the Hospital all patients are prescribed complete rest, lasting from a few days to several weeks, according to the individual case.

II. STAGE OF REGULATED EXERCISES.

This includes:

1. Walking varying distances, from \( \frac{1}{4} \) to 5 miles -
   (a) on the level; (b) on sloping ground.
2. Various respiratory exercises once or twice a day.
3. Other forms of movements to improve carriage of shoulders, head, chest, etc.

III. STAGE OF REGULATED WORK.

The work is chosen with a view to utility and with due regard to the patient's individual case, and to his past trade. This stage is subdivided into four grades (A,B,C,D).

GRADE A.

Picking up papers, leaves, and other light rubbish in the grounds.
Knitting, Sewing. Drawing.

GRADE B.

Emptying garden waste-boxes, and assisting to carry away rubbish.
Carrying light baskets for various gardening purposes.
Light painting work (gates, fences, furniture, etc.)
Wiping shelters. Setting tables, and laying cloth in patients' dining-room.
Cleaning silver.
Cleaning brasses, towel-rails, and taps.
GRADE C.

Drawing two-wheeled barrow with assistance.
Other gardening jobs requiring a similar amount of exertion.
Heavier painting work.
Sweeping shelters. Scrubbing floors.
Cleaning boots. Cleaning knives.
Assisting in Laundry (folding clothes, etc.)
Washing and drying dishes.

GRADE D.

Digging. Sawing.
Carrying heavy baskets for various gardening purposes.
Wheeling and drawing full wheel-barrow, and other heavy gardening work.
Drawing bath chair.
Bathing other patients.
Mangling. Window cleaning.
Polishing floors. Sweeping and cleaning courtyard.
Attending boiler. Engineering.

N.B.- In Grades B, C, and D, patients make their own beds and go errands if necessary.
APPENDIX III.

SCHEME OF GRAPHIC SIGNS AND ABBREVIATIONS USED IN THE SUBSEQUENT CASE SHEETS TO DESCRIBE THE CONDITION OF THE CHEST ON PHYSICAL EXAMINATION.

<table>
<thead>
<tr>
<th>Percussion</th>
<th>Signs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slight dullness</td>
<td><img src="image1" alt="Slight Dullness" /></td>
</tr>
<tr>
<td>Moderate dullness</td>
<td><img src="image2" alt="Moderate Dullness" /></td>
</tr>
<tr>
<td>Marked dullness</td>
<td><img src="image3" alt="Marked Dullness" /></td>
</tr>
<tr>
<td>Absolute dullness</td>
<td><img src="image4" alt="Absolute Dullness" /></td>
</tr>
<tr>
<td>Tympanitic resonance</td>
<td><img src="image5" alt="Tympanitic Resonance" /></td>
</tr>
<tr>
<td>Hyper-resonance</td>
<td><img src="image6" alt="Hyper-resonance" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Palpation</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Vocal fremitus slightly increased</td>
<td>V.F. +</td>
</tr>
<tr>
<td>Vocal fremitus moderately increased</td>
<td>V.F. ++</td>
</tr>
<tr>
<td>Vocal fremitus markedly increased</td>
<td>V.F. +++</td>
</tr>
<tr>
<td>Vocal fremitus diminished</td>
<td>V.F. -</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Auscultation</th>
<th>Abbreviations</th>
<th>Signs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absence of breath sounds</td>
<td>Nil</td>
<td><img src="image7" alt="Absence of Breath Sounds" /></td>
</tr>
<tr>
<td>Vesicular breathing</td>
<td>Vesic..</td>
<td><img src="image8" alt="Vesicular Breathing" /></td>
</tr>
<tr>
<td>Puerile breathing</td>
<td>Puerile</td>
<td><img src="image9" alt="Puerile Breathing" /></td>
</tr>
<tr>
<td>Weak inspiration</td>
<td>Wk.Inspir..</td>
<td><img src="image10" alt="Weak Inspiration" /></td>
</tr>
<tr>
<td>Harsh inspiration</td>
<td>Harsh Inspir.</td>
<td><img src="image11" alt="Harsh Inspiration" /></td>
</tr>
<tr>
<td>Wavy inspiration</td>
<td>Wavy Inspir.</td>
<td><img src="image12" alt="Wavy Inspiration" /></td>
</tr>
<tr>
<td>Cog-wheel inspiration</td>
<td>Cog-wheel</td>
<td><img src="image13" alt="Cog-wheel Inspiration" /></td>
</tr>
<tr>
<td>Metamorphosing inspiration</td>
<td>Metamorph..</td>
<td><img src="image14" alt="Metamorphosing Inspiration" /></td>
</tr>
<tr>
<td>Prolonged expiration</td>
<td>Xp.</td>
<td><img src="image15" alt="Prolonged Expiration" /></td>
</tr>
<tr>
<td>Broncho-vesicular breathing</td>
<td>Br.-ves.</td>
<td><img src="image16" alt="Broncho-vesicular Breathing" /></td>
</tr>
<tr>
<td>High-pitched bronchial breathing</td>
<td>High Br.</td>
<td><img src="image17" alt="High-pitched Bronchial Breathing" /></td>
</tr>
<tr>
<td>Medium-pitched bronchial breathing</td>
<td>Medium Br.</td>
<td><img src="image18" alt="Medium-pitched Bronchial Breathing" /></td>
</tr>
</tbody>
</table>
## Auscultation

<table>
<thead>
<tr>
<th>Variety</th>
<th>Abbreviations</th>
<th>Signs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-pitched bronchial breathing</td>
<td>L.Br.</td>
<td>❌</td>
</tr>
<tr>
<td>High-pitched amphoric breathing</td>
<td>H. Amph.</td>
<td>○○</td>
</tr>
<tr>
<td>Medium-pitched amphoric breathing</td>
<td>M. Amph.</td>
<td>○○</td>
</tr>
<tr>
<td>Low-pitched amphoric breathing</td>
<td>L. Amph.</td>
<td>○○</td>
</tr>
</tbody>
</table>

### Vocal Resonance

- Vocal resonance slightly increased: V.R.+  
- Vocal resonance moderately increased: V.R.++  
- Vocal resonance markedly increased: V.R.+++ or bronchophony.  
- Whispered resonance: V.R.++++ or pectoriloquy.  
- Consonated resonance: Aëgophony.

### Adventitious Sounds

- Fine crepitations: Sibilant rhonchi  
- Medium râles: Medium rhonchi  
- Bubbling râles: Sonorous rhonchi  
- Consonating râles:  
- Musical rhonchi: Pleural friction
APPENDIX IV.

SCHEME USED TO DESCRIBE THE CONDITIONS OF PATIENTS ON DISCHARGE FROM THE SANATORIUM OR ON TERMINATION OF PRESENT PERIOD OF EXPERIMENT.

"DISEASE ARRESTED." - General health completely restored in every respect, without any sign of disease of the lungs except such as is compatible with a completely healed lesion. Sputum, if still present, free from tubercle bacilli.

"MUCH IMPROVED." - General health good. Physical signs of disease in the lungs, though much diminished, not entirely cleared up, e.g., limited to a few crepitations on cough only. Tubercle bacilli still to be detected in the sputum.

"IMPROVED." - General health improved, but not restored. Physical signs of disease in the lungs still present, though less marked than on admission.

"STATIONARY." - No appreciable improvement in the condition of the lungs or in the general health.

"WORSE." - General or local condition worse.
CASE (1)

Sex M | Age 23 | Occup. Police Constable | Admitted 25.2.24

Complaint
1. Pain in Right Chest
2. Cough
3. Sputum
4. Spitting of Blood
5. Night Sweating

History
Cough and Sputum began after a "Cold" a year ago and have continued since; the sputum blood a month ago; more recently has been lower weight and night sweating.

I. CLINICAL CONDITION

(a) At Commencement

Date 18.8.25
Temp. Range afebrile
Pulse 80-90
Sputum 3/7 daily
T.B. +
Assessment L2

(b) At termination

Date 19.1.25
Temp. Range afebrile
Pulse 80-85
Sputum 3/7 daily
T.B. +
Assessment I

Work Capacity III D

II. PROGRESS

Fair, Temp + Pulse steady, Cough v. slight, No further Blood Sputum. Often tired.

II. SPIROMETRY

Chest Circum. Stem length - Corrected Normal V.C.

Class A (or Phys. Fitness) 35.0" 37-8" 46.07 cc

Date Vital Capac. [% of normal = -18.1; % change during treatment = +9.2]


Percentage Change = +4.5
CASE (2)

Sex M | Age 21 | Occup. Commercial Traveller | Admitted 14/10/25

Complaint
(1) Cough (2) Sputum (3) Breathless (4) Haemopt (5) Tightness of chest

History
Since childhood has been subject to recurrent attacks of bronchitis. Recently tiredness and loss of weight.

I. CLINICAL CONDITION
(a) At Commencement

Date 16/10/25
Temp. Range 98-99.4°F
Pulse 90-100
Sputum 3/5 daily
T.B. neg.
Assessment H2 w/Ch.Bronch.

(b) At termination

Date 16/1.25
Temp. Range 97-98.8°F
Pulse 90
Sputum 3††
T.B. neg.
Assessment I
Work Capacity ⌂

PROGRESS
Fair. Temp & Pulse show small daily oscillations. Had several bronchitic attacks - one on Oct. 27th.

II. SPIROMETRY
Chest Circum. Stem length, Computed Normal

| Class C of Phys. Fitness | 32.0" | 33.0" | 31.3-7 cc |
Date | Vital Capac. |
| 2400 | 2250 | 2400 | 2410 | 2410 | 2450 |

% of normal = 123.5; % change during treatment = +2.1%

Date 16/10 | 30/10 | 14/11 | 24/11 | 25/12 | 14/1 |
Weight 8.4 lbs | 8.5 lbs | 8.6 lbs | 8.6 lbs | 8.5 lbs | 8.5 lbs | 8.5 lbs | 8.5 lbs

Percentage Change = +4.3
CASE (3)

Sex M Age 12 Occup. School Admitted 26.9.24

Complaint Cough, Sputum, Painful glands

History Cough and glands began a year ago and cough 6 months ago. Losing weight recently

I. CLINICAL CONDITION

(a) At Commencement

Date 26.9.24

Temp. Range afebrile

Pulse 80

Sputum ++

T.B. neg

Assessment +cerv.

(b) At termination

Date 16.1.25

Temp. Range afebrile

Pulse 80

Sputum ++

T.B. neg

Assessment D.A.

Work Capacity

PROGRESS

V. good. Chest condition cleared up entirely. Feels fit

II SPIROMETRY

Chest Circum. Stem length

Class C

Date 27/9 28/9 29/9 30/9 11/10 12/10 23/10 27/10 29/10

Vital Capac. 2200, 2150, 2160, 2200, 2200, 2200, 2200

% of normal = -10.9 ; % change during treatment.

Weight 40.1, 51.2, 53.4, 55.1, 56.2, 58, 59, 59.5, 58.7

Percentage Change = +13.0
CASE (4)

Sex M  Age 33  Occup.  Cashier  Admitted 14.3.24

Complaint  Cough  Sputum  Weakness  Loss of weight

History  Cough & Sputum began Jan 1923 - continued since -
-Pharyngitis (left) on June 1924 - Dyspnoea

I. CLINICAL CONDITION

(a) At Commencement

Date  19.8.25
Temp. Range afebrile
Pulse  90-100
Sputum 33 daily
T.B.  +
Assessment  L3 + Pleura

(b) At termination

Date  11.12.25
Temp. Range afebrile
Pulse  90-100
Sputum 33
T.B.  +
Assessment  S
Work Capacity  III A

PROGRESS - None - Tempory relief from signs -but abnormality
- Alimentation -

II. SPIROMETRY.

Chest Circum. Stem length

Class C

<table>
<thead>
<tr>
<th>Date</th>
<th>Vital Capac.</th>
<th>198</th>
<th>197</th>
<th>196</th>
<th>195</th>
<th>194</th>
<th>193</th>
<th>192</th>
<th>191</th>
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</tbody>
</table>

% of normal  -45.3  ; % change during treatment.

Date
Weight

Percentage Change = +1.5
CASE (5)

Sex: M  Age: 27  Occup.: Engineer  Admitted: 30.6.24

Complaint: Cough, Sputum, Tiredness, loss of weight

History: Passed in France 1917. Frequent colds - Cough began 7 months ago.

I. CLINICAL CONDITION
(a) At Commencement
Date: 18.8.24
Temp. Range: 98-99.2
Pulse: 80-95
Sputum: +
T.B.: +
Assessment: I

(b) At termination
Date: 14.11.24
Temp. Range: 97.6-99
Pulse: 80-95
Sputum: +
T.B.: +
Assessment: I

Work Capacity: III

PROGRESS
- Fair. Temp & pulse small oscillations. Earned 100%.

II. SPIROMETRY
Chest Circum. Stem length

<table>
<thead>
<tr>
<th>Date</th>
<th>Vital Capac.</th>
<th>% of normal</th>
<th>% change during treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>26.00, 36.40, 36.50, 38.20, 37.20, 37.00</td>
<td>15.4%</td>
<td>+4.5%</td>
</tr>
</tbody>
</table>

Weight

<table>
<thead>
<tr>
<th>Date</th>
<th>Weight</th>
<th>Percentage Change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>9.71, 9.13, 10.1, 10.2, 10.3, 10.6, 10.7, 10.7, 10.5</td>
<td>6.6%</td>
</tr>
</tbody>
</table>
CASE (6)

Sex M Age 38 Occup. - Barney Admitted 3.12.23

Complaint Cough, Sputum, Hoarseness, loss of weight

History 1922 Pulmonary TB. Pneumonia, Cough & Sputum since

I. CLINICAL CONDITION

(a) At Commencement

Date 18.8.23

Temp. Range 94-98.6

Pulse 90-96

Sputum +

T.B. +

Assessment + Larynx

(b) At termination

Date 9.4.24

Temp.-Range 97-95.8

Pulse 80-90

Sputum +

T.B. +

Assessment I

Work Capacity III A

II SPIROMETRY

Chest Circum. Stem length

Class A

32 3/8

34 5/8

Date [approx.]

24.6, 26.0, 24.70, 25.30

% of normal = -39.4; % change during treatment. on initial obs = +5.4

Date

Weight

24.6, 24.8, 25.4, 25.5, 25.6, 25.7, 25.8

8.7, 8.8, 8.9, 8.10, 8.11, 8.12, 8.13

Percentage Change = +0.83.
Sex: M  Age: 23  Occup.: Barman  Admitted: 14.7.24

Complaint: Pain right side - Cough - Sputum - Night Sweats

History: Cough & Sputum began gradually 6 months ago and have persisted.

I. CLINICAL CONDITION
   (a) At Commencement
      Date: 25.8.24
      Temp. Range: afebrile
      Pulse: 80
      Sputum: ++
      T.B.: neg.
      Assessment: 2

   (b) At termination
      Date: 4.10.24
      Temp. Range: afebrile
      Pulse: 80
      Sputum: ++
      T.B.: neg.
      Assessment: 1
      Work Capacity: III-C

PROGRESS: good with diminution of symptoms

II. SPIROMETRY
   Chest Circum. Stem length
   Class A
   (Reserv.)
   Date: 25.8.24
   Vital Capac.: 25/2, 35/4, 35/4, 35/4, 35/4
   % of normal = -15.2; % change during treatment: +6.3
   Date: 4.2, 4.3, 4.4, 4.5, 4.5, 4.6, 4.10
   Weight: 9.2, 9.3, 9.4, 9.5, 9.6, 9.8
   Percentage Change = +5.5
CASE (8)

Sex M Age 18 Occup. Message Boy Admitted 2.10.24

Complaint Cough - Sputum - night Sweating - Tiredness

History Influenza July 1924 - Cough + Sputum since - with right irritating recently

I. CLINICAL CONDITION

(a) At Commencement

Date 2.10.24

Temp. Range 97.98.8°

Pulse 80-96

Sputum 3

T.B. neg

Assessment L

(b) At termination

Date 19.1.25

Temp-Range afebrile

Pulse 80-86

Sputum 3

T.B. +

Assessment (2) M.I.

Work Capacity TTD

PROGRESS good - Sputum persists - Good worker

II SPIROMETRY

Chest Circum. Stem length

Class C

<table>
<thead>
<tr>
<th>Date</th>
<th>Vital Capac.</th>
<th>% of normal</th>
<th>% change during treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>2/10</td>
<td>2720, 2650, 2730, 2800, 2850, 2940, 3050</td>
<td>-16.8</td>
<td>+12.1</td>
</tr>
</tbody>
</table>

Date Weight

| Date | 8 1/2, 8 1/2, 8 1/2, 8 1/2, 8 1/2, 8 1/2, 8 1/2, 9 1/2, 9 1/2, 9 1/2, 9 1/2, 9 1/2 |

Percentage Change = +5.8
CASE (9)

Sex M Age 15 Occup. Milk boy Admitted 14.11.24
Complaint Cough, Sputum (left)

I. CLINICAL CONDITION

(a) At Commencement

Date 14.11.24
Temp. Range afebrile
Pulse 80
Sputum +
T.B. neg. Obs. T.B.
Assessment

(b) At termination

Date 16.1.25
Temp. Range afebrile
Pulse 80
Sputum +
T.B. neg.
Assessment Not Pulm. Tub.
Work Capacity

PROGRESS Very good, felt fit. T.C.F.R. ---

II SPIROMETRY

Vital Capac. 2700, 2700, 2760, 2760

% of normal + 5 ; % change during treatment.

Weight 6.18 6.72 6.72 6.72 6.72

Percentage Change + 17.9
CASE (10)

Sex M Age 12 Occu. School Admitted 3.7.24

Complaint: Dry cough, tiredness, hoarseness, pain in stomach - right sweating.
History: Tub. abdomen in infancy - always delicate.

I. CLINICAL CONDITION

(a) At Commencement
Date 21.8.25
Temp. Range afebrile
Pulse 70-80
Sputum +
T.B.
"Suspected" OTU
Assessment + Tub. Abdom.

(b) At termination
Date 16.1.25
Temp.-Range afebrile
Pulse 70-80
Sputum +
T.B.
Assessment Not Ptu.
Work Capacity

PROGRESS - good. occasional abdominal pain.

II. SPIROMETRY. Chest Circum. Stem length

Date Vital Capac. % of normal = -1.6 + 8.6
2100 2100 2140 2120 2120 2120 2120 2380

Weight % change during treatment. + 8.6
4.6 4.7 4.7 4.7 4.7 4.7 4.7 4.7
4.4 4.4 4.4 4.4 4.4 4.4 4.4 4.4

Percentage Change = + 20.6
CASE (II)

Sex M  Age 14½  Occup. School  Admitted 16.10.24

Complaint "Swollen Stomach"  "Pain in Stomach"

History  Treated sick children's hosp. about 2 years ago for "Pain in Stomach".

I. CLINICAL CONDITION

(a) At Commencement

Date  16.10.24
Temp. Range  afibrile
Pulse  70-80
Sputum  weal
T.B.  /  Assessment  +  Tub. abd.

(b) At termination

Date  16.1.25
Temp. Range  afibrile
Pulse  70-80
Sputum  weal
T.B.  /  Assessment  M +

II. SPIROMETRY

Chest Circum. Stem length
Class C

Date


% of normal = -11.9 ; % change during treatment = +13.1

Weight 4.12, 4.12, 5.0, 5.2, 5.1, 5.2, 5.4

Percentage Change +5.8
<table>
<thead>
<tr>
<th>Sex</th>
<th>M</th>
<th>Age</th>
<th>23</th>
<th>Occup.</th>
<th>Labourer</th>
<th>Admitted</th>
<th>8.12.24</th>
</tr>
</thead>
</table>

**Complaint**
- Cough
- Sputum
- Pain in abdomen

**History**
- Operation 11.11.24 for Tub. perforation of Bladder which was resected.

### I. CLINICAL CONDITION

**At Commencement**
- **Date**: 8.12.24
- **Temp. Range**: 97-98°
- **Pulse**: 90-96
- **Sputum**: ++
- **T.B.**: neg.
- **Assessment**: L & + Tub. Abd.

**At termination**
- **Date**: 19.1.25
- **Temp.-Range**: afibrile
- **Pulse**: 80-90
- **Sputum**: ++
- **T.B.**: neg.
- **Assessment**: M.I.
- **Work Capacity**: III A

### PROGRESS

### II. SPIROMETRY

<table>
<thead>
<tr>
<th>Class</th>
<th>Chest Circum.</th>
<th>Stem length</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>3'2&quot;</td>
<td>35'2&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>Vital Capac.</th>
<th>% of normal</th>
<th>Change during treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>23.12</td>
<td>12.4</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>Weight</th>
<th>% of normal</th>
<th>Change during treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15</td>
<td>8.9</td>
<td></td>
</tr>
</tbody>
</table>

**Percentage Change** = +12.7
CASE (13)

Sex M Age 46 Occup. clerk Admitted 14.1.24

Complaint Cough, Sputum - Breathless

History Pneumonia 1906 1908; Pleurisy 1918 (left) Present symptoms for 2 years

I. CLINICAL CONDITION

(a) At Commencement

Date 18.8.24
Temp. Range 97.6 - 106°
Pulse 90-106
Sputum +
T.B. -
Assessment L 3

(b) At termination

Date 28.8.24
Temp.-Range 99 - 99°
Pulse 90 - 106
Sputum +
T.B. -
Assessment W
Work Capacity 11

PROGRESS - U. poor - breathless - scant but Temp T pulse
    Summizing low - frequent Eumip

II SPIROMETRY.

Chest Circum. Stem length

{Date \ Vital Capac. \ % of normal \ % change during treatment.
\ \ 2/8/1900 \ 55.4 \ -0.48

Weight 9.0% 98%
CASE (14)

Sex M | Age 31 | Occup. Police Constable | Admitted 4.8.24

Complaint Cough. Sputum. Spitting blood. Tiredness

History 4 years ago - wounded left shoulder. Cough + sputum
wth haemoptysis 2 times.

I. CLINICAL CONDITION

(a) At Commencement

Date 18.8.24
Temp. Range afebrile
Pulse 80-90
Sputum ++
T.B. neg.
Assessment \\

(b) At termination

Date 29.9.24
Temp.-Range afebrile
Pulse 80-
Sputum 2
T.B. +
Assessment I
Work Capacity III D

PROGRESS - Fair - returned to light duty

II SPIROMETRY

Class A

<table>
<thead>
<tr>
<th>Vital Capac.</th>
<th>Date</th>
<th>% of normal</th>
<th>% change during treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15 1/2</td>
<td>4300</td>
<td>4400</td>
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<td>15 1/2</td>
<td>4300</td>
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<tr>
<td></td>
<td>15 1/2</td>
<td>4300</td>
<td>4400</td>
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</tbody>
</table>

Date 29.9.24
Weight 11.9, 11.10, 11.12, 11.13

Percentage Change + 3.1
CASE (15)

Sex M  Age 16  Occup. apprentice  Admitted 4.8.24
Complaint  slight spit, loss of weight
History  2 months ago began to have slight spit at

I. CLINICAL CONDITION
(a) At Commencement
Date  18.8.24
Temp. Range  afebrile
Pulse  80
Sputum  +
T.B.  neg
Assessment  "observation TB"

(b) At termination
Date  9.10.24
Temp.-Range  afebrile
Pulse  80
Sputum  +
T.B.  neg
Assessment  m.i.
Work Capacity

PROGRESS  v. good  feels v. well  T.E.F.R. --- 3/9

II. SPIROMETRY.  Chest Circum. Stem length
Class C

Date  Vital Capac.  
15  2430, 2500  15  2510, 2500
% of normal  +1.2  % change during treatment.

Weight  
6.0  6.1  6.4  6.6
Percentage Change  +13.9
CASE (16)

Sex M  Age 13  Occup. School  Admitted 20.6.24

Complaint Cough, tightness in chest, wheezing, breathless attacks

History Sore throat 7 weeks ago

I. CLINICAL CONDITION

(a) At Commencement

<table>
<thead>
<tr>
<th>Date</th>
<th>Temp. Range</th>
<th>Pulse</th>
<th>Sputum</th>
<th>T.B.</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.8.25</td>
<td>98-99°</td>
<td>70-86</td>
<td>Mil</td>
<td></td>
<td>Observation</td>
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</tbody>
</table>

(b) At termination

<table>
<thead>
<tr>
<th>Date</th>
<th>Temp. Range</th>
<th>Pulse</th>
<th>Sputum</th>
<th>T.B.</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.9.24</td>
<td>Afebrile</td>
<td>70-80</td>
<td>Mil</td>
<td></td>
<td>Bronchitis not TB</td>
</tr>
</tbody>
</table>

Work Capacity

PROGRESS Good

T.C.F.R. -

---

II SPIROMETRY

<table>
<thead>
<tr>
<th>Date</th>
<th>Vital Capac.</th>
<th>% of normal</th>
<th>Change during treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1860 / 1900</td>
<td>-14.9%</td>
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</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>Weight</th>
<th>% Change</th>
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</thead>
<tbody>
<tr>
<td>26.8&quot;</td>
<td>28.5&quot;</td>
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</tbody>
</table>

Chest Circum. Stem length

Percentage Change +1.4
Sex M Age 12 Occup. School Admitted 5.6.24
Complaint Night Sweating - Pains in neck
History 2 years - tiredness - night sweating.

I. CLINICAL CONDITION
(a) At Commencement
Date 15.8.24
Temp. Range afbrile
Pulse 80
Sputum +
T.B. +
Assessment "observation"

(b) At termination
Date 4.11.24
Temp-Range 98-99°
Pulse 80-90
Sputum +
T.B. +
Assessment "Aden. tub. not found"

Work Capacity

PROGRESS - good - occasional oscillations of temp. accompanying attacks of adenitis.

II. SPIROMETRY. Chest Circum. Stem length
           Classic      26"      27 8/10"
                        Date        1/8  1/9  1/10 1/11 1/12 22/10
                        Vital Capac. 2080 2150 2100 2180 2230
                        % of normal - 0.9 ; % change during treatment. in initial obs. = +5.2
                        DateWeight       5'6, 5'8, 5'8, 5'8, 5'8, 5'8/4
                        Percentage Change = +2.6

Happy New Year!
CASE (18)

Sex M Age 9 Occup. School Admitted 13-1-25

Complaint Cough. Sputum

History 6 years ago Bronchitis.

I. CLINICAL CONDITION

(a) At Commencement

Date 14-1-25

Temp. Range afebrile

Pulse 80

Sputum ++

T.B. /

Assessment /

(b) At termination

Date /

Temp.-Range /

Pulse {one observation only}

Sputum /

T.B. /

Assessment /

Work Capacity /

PROGRESS so far:

II SPIROMETRY.

Chest Circum. Stem length -

Class C 24.0" 26 1/2" 1843

Date 14-1-25

Vital Capac. [1650]

% of normal -10.3% % change during treatment.

Date 14-1-25

Weight [4.9%]

Percentage Change
CASE (19)

Sex M Age 42 Occur. Book-binder Admitted 12.8.24
Complaint Cough, Pain, Breathlessness
History Always been troubled with Bronchitis - for many years also with TB.

I. CLINICAL CONDITION
   (a) At Commencement
   Date 18.8.24
   Temp. Range 98-99.4
   Pulse 100
   Sputum +
   T.B. +
   Assessment L 3

   (b) At termination
   Date 19.1.26
   Temp. Range Afebrile
   Pulse 70
   Sputum +
   T.B. +
   Assessment IV A
   Work Capacity 11/4 A

PROGRESS Temp. Pulse oscillated during first week. Lent fibrious pleurisy 4/3. 5 1/2
II SPIROMETRY Chest Circum. Stem length - Comp. U.C. Min.
   Class A (67 series)
   Date 3 4 5 6 7 8
   Vital Capac. 3 4 5 6 7 8
   22.22, 22.60, 23.00, 21.02, 21.20, 23.50, 24.00, 24.60
   % of normal - 46.7; % change during treatment.
   Date ½ 3 4 5 6 7 8 9 10
   Weight 7 1/2, 7 6, 7 8, 7 4, 7 3, 6 5, 6 6
   Percentage Change 2 + 10
CASE (20)

Sex M  Age 22  Occup. mill worker  Admitted 19.9.24

Complaint Ulcerated glands of neck

History 6 years discharge from tuberculous ulceration of glands of neck.

I. CLINICAL CONDITION

(a) At Commencement

Date 19.9.24
Temp. Range afebrile
Pulse 90
Sputum +
T.B. neg.
Assessment

(b) At termination

Date 19.1.25
Temp-Range afebrile
Pulse 86
Sputum -
T.B. neg.
Assessment III D
Work Capacity

PROGRESS

Good - ulcer in neck gradually healed.

II. SPIROMETRY

Chest Circum. Stem length

Class B 33 3/4", 36 3/4", 39 44"a

Date
Vital Capac. 14 12 12 22 17 12 18 13
3900 4020 3850 3900 4050

% of normal -1.1 ; % change during treatment.

Date
Weight 8.4, 8.12, 8.9, 8.12, 8.11, 8.14, 8.13, 9.2

Percentage Change +9.4
CASE (21)

Sex M  Age 18  Occup. Pupil School  Admitted 23.3.24

Complaint Cough  Sputum  Weakness

History Bronchitis since childhood - Rheumatic fever resulting in mitral incompetence

I. CLINICAL CONDITION

(a) At Commencement

Date  18.8.24
Temp. Range  98°F - 99°F
Pulse  100
Sputum  ++
T.B.  +
Assessment  2

(b) At termination

Date  19.1.25
Temp. Range  98°F - 99°F
Pulse  96
Sputum  ++
T.B.  +
Assessment  1

Work Capacity  III

PROGRESS  fair - periods of stability + instability

II SPIROMETRY

Chest Circum. Stem length, Comp. Normal

<table>
<thead>
<tr>
<th>Class</th>
<th>33°</th>
<th>36°</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1.8</td>
<td>1.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vital Capac.</th>
<th>1300, 1400, 1500, 1600, 1700, 1800, 1900, 2000, 2100</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of normal</td>
<td>-21.3; % change during treatment.</td>
</tr>
<tr>
<td>Weight</td>
<td>9.8, 9.9, 9.11, 9.12, 9.12, 9.11, 9.2, 9.6, 9.8, 9.9</td>
</tr>
</tbody>
</table>

Percentage Change  +2.3
C A S H. (22)

Sex M Age 21 Occu  Goods Checker Admitted 1.11.24

Complaint Cough, Sputum, Haemoptysis

History Operation on Tub. Cerv. Lungs 3 years ago
Haemoptysis 12 weeks ago

I. CLINICAL CONDITION
(a) At Commencement
Date 1.11.24
Temp. Range 9°F-99°F
Pulse 90
Sputum 3+
T.B. +
Assessment M I

(b) At termination
Date 19.1.25
Temp-Range afebrile
Pulse 100
Sputum 3+
T.B. +
Assessment M I

Work Capacity III D.

PROGRESS good

II SPIROMETRY. Chest Circum. Stem length, V.C. normal

\[ C a l s s C. \]
\[ 31 \frac{6}{8}, 35.0, 332.9 \text{cc} \]

\[ \text{Vital Capac.} \]
\[ \begin{aligned}
& \frac{17}{11}, \frac{22}{11}, \frac{24}{11}, \frac{22}{12}, \frac{15}{12}, \\
& 25.10, 26.00, 26.50, 28.20
\end{aligned} \]

\( \% \) of normal - 24.6 ; \% change during treatment. + 12.3

\[ \text{Date} \]
\[ \frac{17}{11}, \frac{22}{11}, \frac{24}{11}, \frac{22}{12}, \frac{15}{12}, \frac{51}{1}, \frac{22}{7} \]

\[ \text{Weight} \]
\[ 8.3, 8.9, 9.0, 8.12, 9.2, 9.2, 9.3 \]

Percentage Change + 12.1
CASE (23)

Sex M  Age 32  Occup. Mason  Admitted 18-9-24
Complaint  Cough ( slight) - Fait, Flatus
History  9 months ago - Cough began

I. CLINICAL CONDITION
(a) At Commencement
Date  18-9-24
Temp. Range  97.5-99
Pulse  80-100
Sputum  3
T.B.  +
Assessment  l28

(b) At termination
Date  15-1-25
Temp.-Range  afebrile
Pulse  90 -
Sputum  3
T.B.  +
Assessment  I
Work Capacity  III B

PROGRESS  daily oscillations of Temp till recently.
steady increase

II SPIROMETRY.  Chest Circum. Stem length  - V. C. Normal

<table>
<thead>
<tr>
<th>Class</th>
<th>Chest Circum.</th>
<th>Stem length</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>34.8&quot;</td>
<td>35.6&quot;</td>
</tr>
<tr>
<td>B</td>
<td>35.8&quot;</td>
<td>36.5&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>Vital Capac.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2800, 2900, 2950, 3000, 3050, 3100, 3150, 3200</td>
</tr>
</tbody>
</table>

% of normal  -30.6  ;  % change during treatment.
on initial test 2 + 13.8

<table>
<thead>
<tr>
<th>Date</th>
<th>Weight</th>
</tr>
</thead>
</table>

Percentage Change  +3.2
CASE (24)

Sex M  Age 16  Occup. S. Baker  Admitted 20.12.24

Complaint Loss of Weigh, Tiredness, Cough.

History 3 months ago "influenza" since when cough.

I. CLINICAL CONDITION

(a) At Commencement

Date 20.12.24

Temp. Range 97-99.2°

Pulse 80-90

Sputum +

T.B. +

Assessment 2-4

(b) At termination

Date 19.1.25

Temp.-Range afebrile

Pulse 90

Sputum +

T.B. +

Assessment I

Work Capacity -

II. SPIROMETRY

Chest Circum. Stem length 313/8" - 32 5/8" - 306 2

Class C

Date Vital Capac. 22 1/2 17 1/2 19

% of normal 3900, 2860, 2950

% change during treatment.

Date 22 1/2 2 8

Weight 8'4 8'6

Percentage Change +8.2
CASE (25)

Sex M  Age 25  Occup. Upholsterer  Admitted 1.11.24

Complaint  Cough - Spit, Tiredness

History  1919 Pneumonic (left side) - Subject to winter colds.

I.  CLINICAL CONDITION

(a)  At Commencement

Date  1.11.24
Temp. Range  94-98
Pulse  90
Sputum  +3
T.B.  neg.
Assessment  "Observation" T.B.

(b)  At termination

Date  19.1.25
Temp-Range  98
Pulse  90
Sputum  +3
T.B.  neg.
Assessment  (No Tub. Growth)
Work Capacity  III/II

II.  SPIROMETRY

Chest Circum. Stem length - U.C. Normal

<table>
<thead>
<tr>
<th>Date</th>
<th>Vital Capac.</th>
<th>% of normal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>+10.2</td>
</tr>
</tbody>
</table>

Weight  9.0, 9.8, 9.7, 9.1, 9.3

Percentage Change
CASE (26)

Sex M Age 21 Occup. Electrician Admitted 7. 4. 24

Complaint Cough, Sputum, Night Sweating, Stealing

History Various Hospitals before admission

I. CLINICAL CONDITION
(a) At Commencement
Date 21. 4. 24
Temp. Range 99 - 100° F
Pulse 80 - 100
Sputum 2
T.B. +
Assessment

(b) At termination
Date 19. 1. 25
Temp. Range 94. 4 - 104° F
Pulse 50 - 100
Sputum 3
T.B. +
Assessment
Work Capacity 2

II. PROGRESS
Poor Planning 7. 4. 24 to 21. 4. 24

SPIROMETRY

Chest Circum. Stem length J. C. Normal

Date Vital Capac. 74 71 159 159 276 12 231 17
2, 255 2, 410 2, 450 2, 050 2, 120 2, 010 1, 900 1, 940

% of normal -32.2 ; % change during treatment.

Date Weight 15 10 10 10 10 10 10 10

Percentage Change

V. E. their index their weight

1/3 1/2 1/4 1/5 1/6 1/7 1/8 1/9
CASE. (27)

Sex M Age 21 Occup. Farmer Admitted 10. 10. 24

Complaint Cough, Sputum, Pain Right Chest, Dyspnoea.

History 1923 Double Pneumonia - R. V. H in 1923 (November).

I. CLINICAL CONDITION

(a) At Commencement
Date 10. 9. 24
Temp. Range 97.9 - 99.2
Pulse 90 - 110
Sputum +
T.B. +
Assessment

(b) At termination
Date 10. 10. 24
Temp. Range 97.6 - 100.2
Pulse 90 - 106
Sputum +
T.B. +
Assessment

Work Capacity

PROGRESS - Poor

II SPIROMETRY. Chest Circum. Stem length V.C. unusual
Class C. 33 3/8" 15 5/8" 3994 cc.

Date Vital Capac. % of normal % change during treatment
\{ 10 12 14 \}
\{ 1700, 1720, 1660 \}

Date Weight
\{ 10 12 14 \}
\{ 135, 17, 19 \}

Percentage Change
CASE (28)

Sex M Age 31 Occup. Reutter Admitted 4.10.24

Complaint Cough, sputum, pain in back, night sweatings

History 1913 cough and spit since when they have continued more or less.

I. CLINICAL CONDITION

(a) At Commencement

Date 4.10.24
Temp. Range afebrile
Pulse 80
Sputum +
T.B. +
Assessment L

(b) At termination

Date 7.1.25
Temp. Range afebrile
Pulse 80
Sputum +
T.B. +
Assessment W.I.
Work Capacity 11.2

PROGRESS very good.

II SPIROMETRY. Chest Circum. Stem length, Normal V.C.

Class C 31/4" 34 3/8" 3369

<table>
<thead>
<tr>
<th>Date</th>
<th>Vital Capac.</th>
<th>% of normal</th>
<th>% change during treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>300, 300, 320, 320, 320, 330</td>
<td>+12</td>
<td>+10.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4.12, 4.9, 8.5, 8.7, 8.9, 8.9</td>
</tr>
</tbody>
</table>

Percentage Change = +11.1
CASE. (29)

Sex M  Age 65  Occup. Miller  Admitted 18.10.24

Complaint  Cough, Sputum, Weakness, Loss of Weight

History  Cough & Sputum after "Influenza" several years ago.

I. CLINICAL CONDITION

(a) At Commencement

Date  18.10.24
Temp. Range  afebrile
Pulse  80
Sputum  +
T.B.  +
Assessment  

(b) At termination

Date  6.1.25
Temp.-Range  afebrile
Pulse  86
Sputum  +
T.B.  +
Assessment  

Work Capacity  III/13

PROGRESS  good, uncomplicated.

II. SPIROMETRY.

Chest Circum. Stem length, Normal V.C.

Class C.

\[
\begin{array}{cccc}
\text{Date} & \text{Vital Capac.} & \% \text{ of normal} & \% \text{change during treatment} \\
\text{Date} & 30^\circ & 27^\circ & 15^\circ & 26^\circ & 22^\circ & 3.2222, 3.232, 3.2340, 3.2350 \\
\text{Weight} & 9.3, 9.4, 9.11, 10.09, 10.11, 10.1, 10.7 \\
\end{array}
\]

Percentage Change  +12.2

Effect of Age on Vital Capacity
CASE (30)

Sex: M  | Age: 30  | Occup.: Labourer  | Admitted: 19.7.24

Complaint: Cough, Sputum, Pain left side of chest, Night Sweating

History: Feb 1924 - "Influenza" + Flumary - Cough since

I. CLINICAL CONDITION

(a) At Commencement

Date: 21.8.24
Temp. Range: 99-101
Pulse: 110
Sputum: +
T.B.: +
Assessment: H2S

(b) At termination

Date: 7.1.25
Temp. Range: Afebrile
Pulse: 90
Sputum: +
T.B.: +
Assessment: M.I.

Work Capacity III B

PROGRESS

Very good after the first month.

II. SPIROMETRY.

Chest Circum. Stem length Surf. Area

Normal U.C. 34 3/4 35 3/4 4 3 4 6

Date: [Diagram]
Vital Capac. 2400, 2480, 2560, 2590, 2620, 2700, 2810, 2840.

% of normal -44.7; % change during treatment.

Date: [Diagram]
Weight: 10.9, 10.73, 11.5, 11.4, 11.8, 11.9, 11.7, 11.8, 11.6

Percentage Change +8.1
CASE (31)

Sex 30 Age M Occup. Engineer Admitted 8.10.24
Complaint Cough, Sputum, Night Sweats, Breathlessness
History 2 months ago, "Influenza"

I. CLINICAL CONDITION
(a) At Commencement
Date 8.10.24
Temp. Range 9.7-9.94
Pulse 90
Sputum +
T.B. +
Assessment L2R

(b) At termination
Date 14.1.25
Temp. Range afebrile
Pulse 80
Sputum +
T.B. +
Assessment M.I.
Work Capacity III C.

PROGRESS v. good

II. SPIROMETRY. Chest Circum. Stem length Normal U.C.
Class A

<table>
<thead>
<tr>
<th>Class</th>
<th>(x Service)</th>
<th>Date</th>
<th>Vital Capac.</th>
<th>% of normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>33.8</td>
<td>33.8</td>
<td>34.5</td>
<td>41.5</td>
</tr>
</tbody>
</table>

Date
Vital Capac. 2900, 2950, 3000, 3120, 3200, 3300, 3330.

% of normal - 29.8; % change during treatment.

Date
Weight 9.4, 9.5, 9.8, 9.9, 9.1, 9.1, 9.1, 9.1

Percentage Change + S.4
CASE (32)

Sex M  Age 24  Occup. Railway Worker  Admitted 3.11.24
Complaint  Cough, Sputum
History  6 months bad "cold". Sore when cough out till

I. CLINICAL CONDITION
(a) At Commencement
Date 3.11.24
Temp. Range  ashen
Pulse 80
Sputum 3
T.B.  neg
Assessment L

(b) At termination
Date 17.1.25
Temp.-Range  ashen
Pulse 8
Sputum 3
T.B.  neg
Assessment M. I
Work Capacity D

PROGRESS

II SPIROMETRY.

<table>
<thead>
<tr>
<th>Date</th>
<th>Vital Capac.</th>
<th>% of normal</th>
<th>% change during treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Initial U.C.</td>
<td>+8.9</td>
</tr>
</tbody>
</table>

Percentage Change +14.3
**CASE (33)**

Sex M  
Age 47  
Occup. Printer  
Admitted 17.11.74

Complaint  
Loss of weight, cough.

History  
Cough and chest for years.

---

**I. CLINICAL CONDITION**

(a) At Commencement

<table>
<thead>
<tr>
<th>Date</th>
<th>Temp. Range</th>
<th>Pulse</th>
<th>Sputum</th>
<th>T.B.</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.11.74</td>
<td>94.4-99°F</td>
<td>90-100</td>
<td>3/4</td>
<td>-</td>
<td>L3B</td>
</tr>
</tbody>
</table>

(b) At termination

<table>
<thead>
<tr>
<th>Date</th>
<th>Temp-Range</th>
<th>Pulse</th>
<th>Sputum</th>
<th>T.B.</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.11.75</td>
<td></td>
<td>80</td>
<td></td>
<td>-</td>
<td>M.I.</td>
</tr>
</tbody>
</table>

**PROGRESS**

J: Good - Uneventful

---

**II. SPIROMETRY**

Chest Circum. Stem length Normal VC

<table>
<thead>
<tr>
<th>Class</th>
<th>Chest Circum.</th>
<th>Stem length</th>
<th>Normal VC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>34&quot;</td>
<td>35&quot;</td>
<td>42.9&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>Vital Capac.</th>
<th>% of normal</th>
<th>Change during treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>11/74</td>
<td>3050</td>
<td>29.1</td>
<td>+11.8</td>
</tr>
<tr>
<td>24</td>
<td>17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3050</td>
<td>11/2000</td>
<td>3220</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>3410</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>Weight</th>
<th>Percentage Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>11/74</td>
<td>5.6</td>
<td>+4.6</td>
</tr>
<tr>
<td>24</td>
<td>8.8</td>
<td></td>
</tr>
<tr>
<td>11/2000</td>
<td>8.12</td>
<td></td>
</tr>
<tr>
<td>3410</td>
<td>9.0</td>
<td></td>
</tr>
<tr>
<td>9.2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CASE (34)

Sex M  Age 26  Occup. Rubber Worker  Admitted 4.12.24

Complaint  Spitting blood, cough

History - v. recent

I. CLINICAL CONDITION
   (a) At Commencement
      Date 4.12.24
      Temp. Range afebrile
      Pulse 80
      Sputum +
      T.B. neg
      Assessment 21

   (b) At termination
      Date 19.1.25
      Temp. Range afebrile
      Pulse 80
      Sputum +
      T.B. +
      Assessment M. I
      Work Capacity III

PROGRESS  v. good

II. SPIROMETRY. Chest Circum. Stem length, Normal U.C

   Date  Vital Capac.  % of normal  Change during treatment
   4.7.24  4.700  35%  +6.2%  on initial obs. +2.3
   4.9.24  4.950
   4.11.24  4.810

   Weight
   4.4.24  4.49
   4.9.24  4.72
   4.11.24  4.12
   4.12.24  4.13

Percentage Change  +6.1%

  Dreiser's standard too low.
CASE (35)

Sex M Age 19 Occup. Brewer Admitted 3.7.24
Complaint Tiredness, Cough. Sputum. Loss of Weight
History 8 weeks. "Bad cold" theme and "fever"
continued.

I. CLINICAL CONDITION

(a) At Commencement

Date 21.8.24
Temp. Range afebrile
Pulse 80
Sputum 3+/-
T.B. +
Assessment L

(b) At termination

Date 19.1.25
Temp. Range afebrile than earlier
Pulse 90
Sputum 3/3
T.B. +
Assessment W
Work Capacity III IV

PROGRESS. Good at first - then relapse in Dec. (see Text)

II SPIROMETRY. Chest Circum. Stem length "Normal V.C.

Class C 38 38 34.56

Date Vital Capac. 33 33 30 34.0 34.5 34.0 34.0 34.0 34.0 34.0 34.0

% of normal - 4.2 ; % change during treatment.

<table>
<thead>
<tr>
<th>Date</th>
<th>Vital Cap.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/10</td>
<td>33.0</td>
</tr>
<tr>
<td>3/15</td>
<td>33.0</td>
</tr>
<tr>
<td>3/20</td>
<td>34.0</td>
</tr>
<tr>
<td>3/25</td>
<td>34.0</td>
</tr>
<tr>
<td>3/30</td>
<td>34.0</td>
</tr>
<tr>
<td>3/35</td>
<td>34.0</td>
</tr>
</tbody>
</table>

Percentage Change +0.8

Illustrates Value of V.C. in Prognosis (see Text)
CASE (36)

Sex M Age 10 Occup. School Admitted 4.11.24

Complaint

- Cough, Sputum, Night sweats, Loss of weight

History

- Weak chest since infancy with recurrent attacks of pneumonia.

I. CLINICAL CONDITION

(a) At Commencement

Date 4.11.24
Temp. Range 97.99.2°
Pulse 96
Sputum +
T.B. ref.
Assessment L 3

(b) At termination

Date 19.1.25
Temp Range 97.4-99.8°
Pulse 100
Sputum w
T.B.
Assessment W

Work Capacity

PROGRESS

Poor, Temp. Pulse oscillations very erratic.

II. SPIROMETRY

Chest Circum. Stem length Normal U.C.
class

<table>
<thead>
<tr>
<th>Date</th>
<th>Vital Capac.</th>
<th>% of normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/21</td>
<td>1600, 1650, 1710, 1620, 1630</td>
<td>-23.9</td>
</tr>
</tbody>
</table>

% change during treatment: 4.4

Weight 3.3, 4.2, 4.3, 4.4, 4.4

Percentage Change +9.1

Illustrator: Mrs. T. F. 2/4. Fallacy of Weight.
**CASE (37)**

<table>
<thead>
<tr>
<th>Sex</th>
<th>Age</th>
<th>Occup.</th>
<th>School</th>
<th>Admitted</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>7</td>
<td></td>
<td></td>
<td>15.8.24</td>
</tr>
</tbody>
</table>

Complaint: "Lung cold in health - Serous Keratitis.

History: 1922, Pulmonary; Left lump - Recurred 1923.

---

**I. CLINICAL CONDITION**

(a) At Commencement

<table>
<thead>
<tr>
<th>Date</th>
<th>Temp. Range</th>
<th>Pulse</th>
<th>Sputum</th>
<th>T.B.</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>21.8.24</td>
<td>97.6-98.8°</td>
<td>90</td>
<td>nil</td>
<td>/</td>
<td>2.5</td>
</tr>
</tbody>
</table>

(b) At termination

<table>
<thead>
<tr>
<th>Date</th>
<th>Temp. Range</th>
<th>Pulse</th>
<th>Sputum</th>
<th>T.B.</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.1.25</td>
<td>afebrile</td>
<td>80</td>
<td>nil</td>
<td>/</td>
<td>M.I.</td>
</tr>
</tbody>
</table>

---

**Work Capacity**

---

**PROGRESS**

Fair - Good after first few weeks. Eye condition very slow in recovering.

---

**II. SPIROMETRY**

<table>
<thead>
<tr>
<th>Chest Circum.</th>
<th>Stem length</th>
<th>Normal V.C.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Class C</td>
<td>26 4/5</td>
</tr>
</tbody>
</table>

- Date: 2/20, 15/20, 13/20, 27/10, 26/11, 23/12, 17/13
- Vital Capac.:
  - 1400, 1460, 1520, 1550, 1620, 1680, 1660

- % of normal: 15.4; % change during treatment: -4.4

- Date: 4/9, 11/9, 25/9, 22/10, 12/11, 30/10, 4/11
- Weight: 3.6, 3.6, 3.5, 3.6, 3.6, 3.7, 3.6, 3.9, 3.10

- Percentage Change: +15.5
Sex: M  
Age: 10  
Occup.: School  
Admitted: 25.11.24

Complaint: slight cough - "not thriving"

History: never a strong child - subject to frequent colds.

I. CLINICAL CONDITION

(a) At Commencement

Date: 25.11.24
Temp. Range: 94.6-99
Pulse: 90
Sputum: nil
T.B.: -
Assessment: L, 5 + Branch

(b) At termination

Date: 19.1.25
Temp. Range: 97.4-98.8
Pulse: 90
Sputum: nil
T.B.: -
Assessment: 1

Work Capacity:

II. SPIROMETRY.

Chest Circum. Stem length: Normal U.C. class C.

<table>
<thead>
<tr>
<th>Date</th>
<th>Vital Capac.</th>
<th>% of normal</th>
<th>Change during treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25/11</td>
<td>520, 22 (12)</td>
<td>48.8, 17.6</td>
<td>+14.5</td>
</tr>
</tbody>
</table>

Weight: 3.13, 3.12, 4.05

Percentage Change: +2.7
CASE (39)

Sex M  Age 41  Occup. Ham Curer.  Admitted 13.9.24

Complaint Spitting blood. Cough

History 4 years ago: Haemoptysis and again 2½ years ago. 3 weeks ago

I. CLINICAL CONDITION

(a) At Commencement

Date 13.9.24

Temp. Range offebrile
Pulse 85
Sputum 3
T.B. neg
Assessment

(b) At termination

Date 19.12.24

Temp. Range offebrile
Pulse 86
Sputum 3
T.B. neg
Assessment D.A.
Work Capacity

PROGRESS

- food - steady improvement

II SPIROMETRY

Chest Circum. Stem length Normal 40.92

Class A

Date [Ex Service] 32.5'' 35.5'' 40.92

Vital Capac. 35.50, 35.40, 36.40, 37.30, 38.10

% of normal 85% ; % change during treatment.

Date 1.2. 3.6 5.9 7.7 9.1 11.6 13.2 15.2

Weight 8.7.9, 9.4, 9.8, 9.11, 9.12, 10.01, 10.2, 10.3.

Percentage Change +19.5.
CASE (40)

Sex M Age 18 Occup. Bottle Worker
Admitted 2. 10. 24

Complaint Cough, Sput, Dyspnoea

History 6 years ago Bronch. Pneumonia + 2 years ago
bad health

I. CLINICAL CONDITION

(a) At Commencement
Date 2. 10. 24
Temp. Range 98-99
Pulse 90
Sputum +
T.B. neg
Assessment H28

(b) At termination
Date 19. 12. 24
Temp. Range afebrile
Pulse 80
Sputum z
T.B. neg
Assessment M.I
Work Capacity II C

PROGRESS very good after the first 3 weeks

II SPIROMETRY. Chest Circum. Stem length Normal U.C.
Class C

Date 2/11 13/10 27/10 10/11 3/12
Vital Capac. 2250, 2320, 2380, 2450, 2550

% of normal -23.7 % change during treatment.

Date 2/11 13/10 27/10 10/11 3/12
Weight 76, 54, 53, 41, 78, 74, 70, 710, 710, 710, 740
Percentage Change +2.3
CASE (41)

Sex M Age 36 Occup. Labourer Admitted 13.11.24

Complaint Cough, Sputum, Pain on right side

History 8 months ago 'Influenza' cough set since

I. CLINICAL CONDITION

(a) At Commencement

Date 13.11.24
Temp. Range 97.0 - 99.2
Pulse 90 - 100
Sputum
T.B.
Assessment L2

(b) At termination

Date 16.12.24
Temp. Range 94.6 - 99
Pulse 90
Sputum
T.B.
Assessment 

Work Capacity III A

PROGRESS

Poor - Oscillations of Temp. Pulse

II. SPIROMETRY.

Chest Circum. Stem length Normal V.C.

Class A

Ex. Service

Date
Vital Capac.
{ 21
21
21
21

\( \frac{2750}{2780} \)
\( \frac{2730}{2730} \)

\% of normal \(-31.7\); \% change during treatment. \(\text{on initial obs.} = +7.3\)

Date
Weight
{ 14
14
14
14

\( \frac{9.11}{9.12} \)
\( \frac{10.2}{10.2} \)

Percentage Change + 4.0
CASE (42)

Sex M  Age 58  Occup. Clerk  Admitted 24.6.24

Complaint Breathless  Cough  Husthness  Tightness of chest

History For years has had cough + lab and rhonchitic attacks

I. CLINICAL CONDITION
(a) At Commencement
Date 21.6.24
Temp. Range 97.8-99°
Pulse 90°
Sputum
T.B. neg.
Assessment L38

(b) At termination
Date 21.11.24
Temp-Range afebrile
Pulse 80
Sputum
T.B. neg.
Assessment
Work Capacity III A

PROGRESS fair, -- periodical oscillations of Temp.

II SPIROMETRY. Chest Circum. Stem length normal

Class C. 3.3/8

\[
\begin{align*}
\text{Date} & : 21/6, 1/7, 15/7, 30/7, 15/8, 27/8, 1/9, 15/9 \\
\text{Vital Capac} & : 1750, 1800, 1800, 1750, 1800, 1800, 1800 \\
\% \text{ of normal} & : -55; \% \text{ change during treatment} \\
\text{Date} & : 4/10, 11/10, 15/10, 23/10, 1/11, 15/11, 23/11, 30/11 \\
\text{Weight} & : 4.7, 4.5, 4.7, 4.7, 4.7, 4.7, 4.7, 4.7, 4.7 \\
\text{Percentage Change} & : +4.9
\end{align*}
\]
CASE (43)

Sex M Age 33 Occup. Baker Admitted 24.7.24

Complaint Cough & Spilt Pus left Side

History April 1924 Pernary with Effusion - Night Sweating - Cough & little Sputum

I. CLINICAL CONDITION

(a) At Commencement

Date 21.5.24
Temp. Range 97°-98°
Pulse 80
Sputum 310
T.B. neg
Assessment L5 & Pleural

(b) At termination

Date 25.11.24
Temp. Range of fever
Pulse 80
Sputum 311
T.B. neg
Assessment D.A.
Work Capacity III D

PROGRESS

V. good after first fortnight - excellent worker.

II SPIROMETRY. Chest Circum. Stem length

<table>
<thead>
<tr>
<th>Date</th>
<th>Vital Capac.</th>
<th>% of normal</th>
<th>Change during treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ex-Serv</td>
<td>28 18</td>
<td>27 10</td>
<td>2.9</td>
</tr>
<tr>
<td>Date</td>
<td>27 8</td>
<td>19 10</td>
<td>13 10</td>
</tr>
<tr>
<td>3050</td>
<td></td>
<td>3150</td>
<td></td>
</tr>
<tr>
<td>3220</td>
<td></td>
<td>3330</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>2.9</td>
<td>12.9</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>10.2</td>
<td>10.6</td>
<td>10.8</td>
</tr>
<tr>
<td>11.4</td>
<td>11.1</td>
<td>11.3</td>
<td>11.3</td>
</tr>
<tr>
<td>Percentage Change</td>
<td>+12.9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CASE (44)

Sex M Age 36 Occup. Stationer Admitted 18.8.24

Complaint Cough, expectorant, night sweats

History 1919 Influenza and again a year ago with cough and skin sickness.

I. CLINICAL CONDITION

(a) At Commencement

Date 18.8.24
Temp. Range 97.8-99.0
Pulse 90
Sputum +
T.B. +
Assessment

(b) At termination

Date 21.11.24
Temp. Range 97.4-98.8
Pulse 90
Sputum +
T.B. +
Assessment

Work Capacity III B.

PROGRESS fair - oscillation of Temp. & Pulse.

II SPIROMETRY. Chest Circum. Stem length, Normal V.C. Class A

<table>
<thead>
<tr>
<th>Date (Ex. Service)</th>
<th>1/9</th>
<th>2/9</th>
<th>3/9</th>
<th>4/9</th>
<th>5/9</th>
<th>6/9</th>
<th>7/9</th>
<th>8/9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vital Capac.</td>
<td>3250</td>
<td>3310</td>
<td>3280</td>
<td>3490</td>
<td>3050</td>
<td>3180</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of normal</td>
<td>-18.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

on initial obs 2.1

<table>
<thead>
<tr>
<th>Date</th>
<th>1/10</th>
<th>2/10</th>
<th>3/10</th>
<th>4/10</th>
<th>5/10</th>
<th>6/10</th>
<th>7/10</th>
<th>8/10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>8.8</td>
<td>8.8</td>
<td>8.9</td>
<td>8.9</td>
<td>9.0</td>
<td>9.0</td>
<td>8.9</td>
<td>8.9</td>
</tr>
</tbody>
</table>

Percentage Change +10.0
CASE (45)

Sex: M  Age: 19  Occ: Bottle Worker  Admitted: 2.7.24

Complaint: Cough, Sputum, Pain in chest, breathless

History: Subject to bronchitis attacks for years.

I. CLINICAL CONDITION

(a) At Commencement

Date: 19.8.24
Temp. Range: 9.4-9.9
Pulse: 85
Sputum: +
T.B.: +
Assessment: L3S

(b) At termination

Date: 13.11.24
Temp-Range: 9.7-9.8
Pulse: 85
Sputum: +
T.B.: +
Assessment: W

Work Capacity: III A.

PROGRESS

Food at beginning, Poor later, Bronchitis attack (29-42)

II SPIROMETRY

Class: C

Chest Circum. Stem length: Normal U.C.

Date: 19, 8, 9, 15, 15, 12, 27, 10, 50

% of normal: -32.2; % change during treatment:
on initial obs. -2.4

Date: 1/8, 1/9, 2/10, 23/10, 7/11

Weight: 6.6, 6.6, 6.8, 6.8

Percentage change: +2.2

Bronchitis attack.
CASE (46)

Sex M  Age 32  Occup. Soldier  Admitted 27.9.24

Complaint: Slight cough - Tiredness - Stated to have once spat up blood

History: For past few months tiredness, loss of weight

I. CLINICAL CONDITION

(a) At Commencement

Date 27.9.24
Temp. Range afebrile
Pulse 80
Sputum 3
T.B. neg
Assessment "Observation"

(b) At termination

Date 27.12.24
Temp. Range afebrile
Pulse 76
Sputum 3
T.B. neg (on treatment)
Assessment "Not TUB"

Work Capacity III

PROGRESS

v. good indeed - good worker

II. SPIROMETRY

Chest Circum. Stem length, Normal U.C.

Class A

\[ \text{Date} \]
\[ 33^{\frac{3}{4}} \text{'} \quad 34^{\frac{3}{4}} \text{'} \quad 40^{25} \]

\[
\begin{align*}
\text{Vital Capac.} & : 272, 240, 220, 171, 152, 4025, 3970, 4050, 4100, 4275 \\
\% \text{ of normal} & : +1.8 \%
\end{align*}
\]

\[
\text{change during treatment.} \quad \{ \text{on initial obs.} \quad +6.8 \%
\]

\[
\text{Weight} \quad 9.8, 9.1, 9.1, 10.0, 10.1, 10.2
\]

\[
\text{Percentage Change} \quad +6.3
\]
CASE (47)

Sex M  Age 39  Occup. laborer  Admitted 14.5.24

Complaint  Cough  Spilt  Anorexia  Breathlessness

History  8 years ago - Bullet wound left Scapular region
This caused up blood during recent year into

I. CLINICAL CONDITION

(a) At Commencement

Date  25.8.25
Temp. Range  94°-98°F
Pulse  75
Sputum  γ
T.B.  neg
Assessment  observation

(b) At termination

Date  21.10.24
Temp. Range  94°-98°F
Pulse  80
Sputum  γ
T.B.  neg
Assessment  No Tub. chronic Bronchitis
Work Capacity  w

PROGRESS good - subject to acute attacks of Bronchitis
had a bad attack on Oct 5. 1944.

II. SPIROMETRY  Chest Circum. Stem length  Normal VC

class (A) 31 3/8 33 26/16

\[ \text{Date} \] \{ Vital Capac. \} \{ % \text{of normal} \} \{ % \text{change during treatment} \}
\[
\begin{align*}
\text{25/8} & \quad \frac{22}{9} & \quad \frac{6}{10} & \quad 19 \% \\
\text{Vital Capac.} & \quad 3150, 2200, 3230, 2650, 3200 \\
\% & \text{of normal} & -12.9 & \% \text{change during treatment} & \text{on initial obs.} +1.9
\end{align*}
\]

Weight \[
\begin{align*}
\text{Date} & \quad \text{Weight} \\
\text{11/9} & \quad 10.04 \\
\text{10/1} & \quad 10.1 \\
\text{9/13} & \quad 9.13
\end{align*}
\]

Percentage Change  + 1.41
CASE (48)

Sex M, Age 29, Occup. Traveller, Admitted 18.7.24

Complaint: Cough, Sputum, Night Sweating, Anorexia

History: "Years bad influenza, with recurrent cough & sputum"

I. CLINICAL CONDITION

(a) At Commencement

Date: 25.8.25
Temp. Range: 97.4-98.8°F
Pulse: 90
Sputum: +
T.B.: +
Assessment: L, I

(b) At termination

Date: 29.10.24
Temp.-Range: 97.4-99.4°F
Pulse: 90
Sputum: +
T.B.: +
Assessment: W

Work Capacity: III A

PROGRESS

None. Oscillations of T. & P. although weight gained.

II SPIROMETRY.

Chest Circum. Stem length Normal VC:

Class A

Date
Vital Capac. 32, 32.2, 32.20, 32.22, 33.30, 30.30

% of normal: 24.6

Date: 4.8, 9.8, 3.8, 3.30, 3.10, 2.3, 2.30
Weight: 9.1, 9.13, 9.14, 10.3, 10.4, 10.1

Percentage Change: 2.1%

Shows unreliability of weight.
CASE (49)

Sex M  Age 41  Occup. Engineer  Admitted 5.3.24

Complaint  Cough & cough - Pain left side

History  18.4.23 bed-blewery & cough - Cough & cough since

I. CLINICAL CONDITION

(a) At Commencement

Date  25.3.24

Temp. Range  afebrile
Pulse  80
Sputum  +ve
T.B.  +ve
Assessment  Leg + Restra

(b) At termination

Date  17.10.24

Temp.-Range  98.4 - 99.4
Pulse  90
Sputum  +ve
T.B.  -ve
Assessment  I

Work Capacity  II D.

PROGRESS  V. fluid till Nocum or 15.9.24 (3 days)

II SPIROMETRY  Chest Circum. Stem length Normal U.C.

Class A

\[
\begin{array}{c|c|c|c|c}
\text{Date} & 3.25 & 3.29 & 3.30 & 3.40 \\
\text{Vital Capac.} & 3220 & 3350 & 2550 & 2680 \\
\end{array}
\]

% of normal  20.3  ; \% change during treatment. on initial obs = -16.1

\[
\begin{array}{c|c|c|c|c}
\text{Date} & 4.0 & 5.0 & 6.0 \\
\text{Weight} & 10.11 & 10.11 & 10.12 \\
\end{array}
\]

Percentage Change  +0.9
Complaint (i) Cough (2) Sputum (3) Night Sweating

History "Influenza" 15 months ago since when Cough and Sputum have continued. Night Sweating 2 months

I. CLINICAL CONDITION

(a) At Commencement
Date 17. 9. 24
Temp. Range 99°-102°
Pulse 90-100
Sputum Z
T.B. +
Assessment L, S

(b) At termination
Date 15. 10. 24
Temp-Range asfebrile
Pulse 90
Sputum Z
T.B. +
Assessment I
Work Capacity III A

II. SPIROMETRY. Chest Circum. Stem length

<table>
<thead>
<tr>
<th>Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
</tr>
</tbody>
</table>

Vital Capac.

<table>
<thead>
<tr>
<th>Date</th>
<th>27.90</th>
<th>28.20</th>
<th>28.50</th>
<th>29.60</th>
<th>30.80</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of normal</td>
<td>-36.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Change during treatment on vital obs. = +14.6

Weight

<table>
<thead>
<tr>
<th>Date</th>
<th>9.11</th>
<th>10.0</th>
<th>10.2</th>
<th>10.7</th>
<th>10.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage Change</td>
<td>+5.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CASE (51)

Sex M Age 38 Occup. saw Clark Admitted 31.7.24

Complaint (1) Cough (2) Sputum (3) Night Sweating

History 6 years ago "Influenza" and also 2 years ago. Haemopysis 2 years ago. Recent weight recently

I. CLINICAL CONDITION

(a) At Commencement

Date 25.8.24
Temp. Range afebrile
Pulse 90
Sputum 3 or daily
T.B. neg.
Assessment L,

(b) At termination

Date 1.9.10.24
Temp.-Range afebrile
Pulse 90
Sputum
T.B. neg.
Assessment

Work Capacity

PROGRESS good

II SPIROMETRY. Chest Circum. Stem length

Class A

Date Vital Capac. % of normal = +0.37 % change during treatment. on initial obs. = +1.6

Date Weight Percentage Change = +0.3%
CASH (52)

Sex M Age 14 Occup. Message boy Admitted 1.5.24

Complaint Tiredness, Cough, Loss of Weight

History Pneumonia (Bronch) infancy recurrent Forms Has been at Colton & Children's Hosp. R.U.H. 1922

I. CLINICAL CONDITION

(a) At Commencement

Date 25.8.25
Temp. Range 99.2°-98°
Pulse 100
Sputum nil
T.B. / Assessment L2/3

(b) At termination

Date 31.10.24
Temp. Range afebrile
Pulse 90
Sputum 3/1 T.B. ref.
Assessment I
Work Capacity III B

PROGRESS

Fair. Temp oscillated at first.

II SPIROMETRY

Chest Circum. Stem length

Class C

Date Vital Capac. 

<table>
<thead>
<tr>
<th>Date</th>
<th>Vital Capac.</th>
</tr>
</thead>
<tbody>
<tr>
<td>25.8</td>
<td>2520, 2600, 2600, 2710, 2730</td>
</tr>
</tbody>
</table>

% of normal = 20.0; % change during treatment:

<table>
<thead>
<tr>
<th>Date</th>
<th>Vital Capac.</th>
</tr>
</thead>
<tbody>
<tr>
<td>25.8</td>
<td>4, 7, 4, 8, 7, 4, 8, 4.8</td>
</tr>
</tbody>
</table>
Percentage Change +3.4
CASE (53)

Sex F Age 27 Occup. Housewife Admitted 1.12.24

Complaint Cough; Spitting, Tiredness.

History For 12 years intermittent cough & spit.

I. CLINICAL CONDITION
(a) At Commencement
Date 1.12.24
Temp. Range 94.4-99.0°
Pulse 95.
Sputum +
T.B. neg
Assessment L2 S

(b) At termination
Date 16.1.25
Temp-Range afebrile
Pulse 80
Sputum nil
T.B. /-
Assessment M.1

Work Capacity

PROGRESS very good - after first week.

II SPIROMETRY

Chest Cireum. Stem length Surf area
29 3/4" 33 5/8" 1.55

Vital Capac. { 1/2 15/12 16/10 Normal U.C.
2.650 2.780 3.120 ; 30 75
% of normal -13.8 ; % change during treatment. = +13 9

Date 4/12, 14/12, 8/2.
Weight 8 4/12, 8 3/2.
Percentage Change +8.8
CASE. (54)

Sex  F  Age  32  Occup.  Nurse  Admitted  4.7.24

Complaint  Pain Right Side  Cough  Sputum  Twaddness

History  1921  Pleurisy & Effusion Right Side  Tub
         Suin  Week  Feb. 1924  Pleurisy (remanent)

I. CLINICAL CONDITION
   (a) At Commencement
   Date  21.8.24
   Temp. Range  afebrile
   Pulse  90
   Sputum  ++
   T.B.  neg
   Assessment

   (b) At termination
   Date  16.1.25
   Temp-Range  afebrile
   Pulse  80
   Sputum  3+)
   T.B.  (on 14 occasions)
   Assessment
   Work Capacity

PROGRESS
   Good  T."R. normal after 2 weeks.
   Right lung function N. little.

II. SPIROMETRY.

<table>
<thead>
<tr>
<th></th>
<th>Chest Circum.</th>
<th>Stem length</th>
<th>Surf. Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>25 1/2</td>
<td>33 1/2</td>
<td>1.64 5'</td>
</tr>
<tr>
<td>Vital Capac.</td>
<td>1450, 1450, 1500, 1600, 1600, 1600, 1620, 1600</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of normal</td>
<td>-56.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% change during treatment</td>
<td>+10.4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Date       | 28 1/8, 28 1/8, 28 1/8, 28 1/8, 28 1/8, 28 1/8, 28 1/8 |
| Weight     | 8.10, 8.10, 8.10, 8.10, 8.10, 8.10, 8.10 |
| Percentage Change | +5.8 |
CASE (55)

Sex F  Age 26  Occup. Nurse  Admitted 14.8.24

Complaint Swollen glands in neck - Tiredness
History Night sweats - anorexia 6 months felt "run down"

I. CLINICAL CONDITION

(a) At Commencement

Date 21.8.24
Temp. Range 97.98.6
Pulse 80
Sputum nil
T.B. -
Assessment Chest Aden Tub

(b) At termination

Date 16.1.25
Temp-Range afebrile
Pulse 75
Sputum nil
T.B. Hands dried up
Assessment No Tub.
Work Capacity

PROGRESS

Tuberculous Slight improvement

II SPIROMETRY.

<table>
<thead>
<tr>
<th>Class</th>
<th>Chest Circum.</th>
<th>Stem length</th>
<th>Surf. Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>28 1/2</td>
<td>34.7</td>
<td>1.45 sq.m.</td>
</tr>
</tbody>
</table>

\[
\text{Date} \{ 22/9, 26/9, 27/10, 1/11, 15/12, 16/1 \\ 
\text{Vital Capac.} \{ 3400, 3420, 3300, 3620, 3650, 3650, 3700 \} \\
\text{% of normal} -2.3 \% \text{change during treatment}. \\
\text{Date} \{ 25/9, 1/11, 1/10, 11/10, 11/10, 11/10, 11/10, 11/10, 11/9, 12/0 \} \\
\text{Weight} \{ 10-10, 10-11, 11-1, 11-0, 11-0, 11-0, 11-0, 11-0, 11-0, 11-0 \} \\
\text{Percentage Change} = +15.1 \\
\text{X Dryer. Too low.} \]
CASE (56)

Sex F, Age 17, Occu. Domestic, Admitted 16/8/24

Complaint: Tiredness, Blood Staining, Cough.

History: 6 months cough then began insidiously.

I. CLINICAL CONDITION

(a) At Commencement

Date: 21/8/24

Temp. Range 94°-99°

Pulse: 80

Sputum: +

T.B.: -

Assessment: Observation

(b) At termination

Date: 16/1/25

Temp-Range: Afebrile

Pulse: 80

Sputum: -

T.B.: -

Assessment: T.C.F.R++

Work Capacity: -

PROGRESS - four oscillations of Temp. Pulse

II SPIROMETRY. Chest Circum. Stem length Surf. Area

Class C: 28 7/12 - 32 5/6

Vital Capac:

Date: 22/9, 23/9, 24/10, 27/10, 11/11, 15/12, 16/1

Vital Capac: 2250, 2310, 2400, 2400, 2450, 2450, 2550

% of normal: -13.9; % change during treatment: +13.7

Weight:

Date: 8/9, 11/9, 19/9, 10/10, 22/10, 11/11, 17/11, 17/12

Weight: 94, 93, 96, 97, 98, 98, 98

Percentage Change: +4.7
CASE (57)

Sex F Age 42 Occup. Housewife Admitted 20.10.24
Complaint Cough  Spit  Tiredness  Night Sweats
History Planning May 1924 since when not feeling well

I. CLINICAL CONDITION

(a) At Commencement

Date 20.10.24
Temp. Range 97.7 - 99
Pulse 80
Sputum 3+
T.B. neg
Assessment Observation

(b) At termination

Date 16.1.25
Temp-Range 97.4 - 98.4
Pulse 85
Sputum 3+
T.B. neg
Assessment Probably No T.B. lesion
Work Capacity Improved

PROGRESS fair - continued oscillations of T. & P.

II SPIROMETRY. Chest Circum. Stem length Surf. Area

<table>
<thead>
<tr>
<th>Class</th>
<th>Vital Capac.</th>
<th>Date</th>
<th>33.8</th>
<th>16.5 sq.m.</th>
<th>Normal U.C.</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>12 40&quot;</td>
<td>21/12</td>
<td>14/14</td>
<td>3650, 3680, 3700, 3650</td>
<td>3308</td>
</tr>
<tr>
<td></td>
<td>30 50</td>
<td>12/10</td>
<td>12/12</td>
<td>12/12</td>
<td></td>
</tr>
<tr>
<td></td>
<td>29 20</td>
<td>12/10</td>
<td>12/12</td>
<td>12/12</td>
<td></td>
</tr>
</tbody>
</table>

% of normal +9.4; % change during treatment.

<table>
<thead>
<tr>
<th>Date</th>
<th>Weight</th>
<th>21/12</th>
<th>21/12</th>
<th>21/12</th>
<th>21/12</th>
<th>21/12</th>
<th>21/12</th>
<th>21/12</th>
</tr>
</thead>
<tbody>
<tr>
<td>28</td>
<td>6'11&quot;</td>
<td>4.7</td>
<td>4.7</td>
<td>4.5</td>
<td>4.5</td>
<td>4.5</td>
<td>4.5</td>
<td>4.5</td>
</tr>
<tr>
<td>29</td>
<td>6'11&quot;</td>
<td>4.7</td>
<td>4.7</td>
<td>4.5</td>
<td>4.5</td>
<td>4.5</td>
<td>4.5</td>
<td>4.5</td>
</tr>
</tbody>
</table>

Percentage Change + 4.3

Percentage Change over Normal
Sex: F  Age: 22  Occu.: Nurse  Admitted: 25.6.21

Complaint: Cough - Sputum - Haemoptysis

History: 3 years - Cough & fit.

I. CLINICAL CONDITION

(a) At Commencement

Date: 18.8.25

Temp. Range: 99.7 - 99.2°F

Pulse: 80

Sputum: +

T.B.: +

Assessment: L23

(b) At termination

Date: 20.9.24

Temp. Range: 97.6 - 98.8°F

Pulse: 80

Sputum: +

T.B.: +

Assessment: S

Work Capacity: 

PROGRESS: - poor - Temp & Pulse oscillating.

II SPIROMETRY.

Chest Circum.: Stem length: Surf. Area: 22.6 32.8 1.5 8.5

Class A.

\[
\text{Vital Capac.} = \frac{15 \frac{3}{4}}{1700}, \frac{3}{4}, \frac{17}{20}\]  

\text{Normal V.C.} = 3142

\% of normal: -45.9  ; \% change during treatment: +1.2

Weight: 11, 14, 8.5

Percentage Change: -8.4
CASE (59)

Sex F  Age 45  Occup. Domestic  Admitted 30.5.24

Complaint  Cough, sputum (copious)  Cyanosis  Toxic symptoms

History  Weak chest since childhood

I. CLINICAL CONDITION

(a) At Commencement

Date  21.8.24
Temp. Range 9.4 - 102
Pulse  100
Sputum  3
T.B. +
Assessment 2

(b) At termination

Date  15.11.24
Temp.-Range 9.4 - 98.2
Pulse  85
Sputum  3
T.B. +
Assessment M. I

Work Capacity  

PROGRESS  Wonderful recovery.

II SPIROMETRY  Chest Circum. Stem length Surf. Area

<table>
<thead>
<tr>
<th>Class</th>
<th>27.5'</th>
<th>32.6'</th>
<th>1.28 sq. m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vital Capac</td>
<td>1150, 1220, 1270, 1300, 1330,</td>
<td>M. V. C.</td>
<td></td>
</tr>
<tr>
<td>% of normal</td>
<td>-5 4.4</td>
<td>% change during treatment.</td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>%</td>
<td>2/3 1/2 3/4 3/10 1/3 2/10</td>
<td>2 13.0</td>
<td></td>
</tr>
</tbody>
</table>

Percentage Change +19.1

Illustrates influence on M. V. C. of toxic factor
CASE (60)

Sex: F  Age: 31  Occup.: Clerk  Admitted: 21.7.24

Complaint: Cough, Sputum, Night Sweating

History: 6 months - gradual onset

I. CLINICAL CONDITION

(a) At Commencement

Date: 21.8.24
Temp. Range: 97.6-102.8
Pulse: 80-120
Sputum: +
T.B.: +
Assessment: L.A.S

(b) At termination

Date: Died
Temp-Range: 97-104
Pulse: 120
Sputum: +
T.B.: +
Assessment: W

Work Capacity:

PROGRESS: Very poor - downhill all the time

II SPIROMETRY.  Chest Circum. Stem length Surf. Area

Class B

<table>
<thead>
<tr>
<th>Date</th>
<th>Vital Capac</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1'750, 1'800</td>
<td>6'7, 6'8, 6'6, 6'7, 6'8, 6'9, 6'10, 6'11</td>
</tr>
</tbody>
</table>

% of normal: 41.4; % change during treatment = died

Percentage Change: -15
CASE. (01)

Sex F Age 15 Occup. School Admitted 7.1.24

Complaint Cough - Tiredness - Sputum - Breathless

History Oct. 1922: Influenza since when has had cough - catarrh

I. CLINICAL CONDITION

(a) At Commencement

Date 21.8.25
Temp. Range afibrile
Pulse 90
Sputum +
T.B. +
Assessment

(b) At termination

Date 11.10.24
Temp-Range afibrile
Pulse 80
Sputum +
T.B. +
Assessment

Work Capacity

II SPIROMETRY.

Chest Circum. Stem length Surf. Area

<table>
<thead>
<tr>
<th>Class</th>
<th>Date</th>
<th>Vital Capac.</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>21/4</td>
<td>2/3 5/4 10/5</td>
<td>1/2 1/0</td>
</tr>
</tbody>
</table>
|       | 1860 1880 1960 | 80 60 | Percentage Change +2.9
|       | 1.14 | | | % of normal -21.6 ; % change during treatment.

Percentage Change +2.9
CASE (62)

Sex: F  Age: 27  Occup.: Nurse  Admitted: 12.10.23

Complaint: Cough, Sputum, Tiredness

History: Pneumony (Right), March 1923.

I. CLINICAL CONDITION
(a) At Commencement

Date: 21.8.24
Temp. Range: 99.4 - 98.6
Pulse: 86
Sputum: +
T.B.: +
Assessment: L2S

(b) At termination

Date: 26.12.24
Temp. Range: 99.6 - 100
Pulse: 90
Sputum: +
T.B.: +
Assessment: W
Work Capacity: —

II. SPIROMETRY.

Chest Circum. 33.8'
Stem length 1.64 sc. cm.

<table>
<thead>
<tr>
<th>Class</th>
<th>Date</th>
<th>Vital Capac.</th>
<th>% of normal</th>
<th>% change during treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td>2250, 2250, 2360, 2400, 2400, 2240</td>
<td>-31.2</td>
<td>-25%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>Weight</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10.0, 9.12, 9.4, 9.13, 10.0, 10.2, 10.4, 10.0, 9.13</td>
<td></td>
</tr>
</tbody>
</table>

Percentage Change: -0.7
**CASE (63)**

Sex F  Age 40  Occup. Housewife  Admitted 21.11.24

Complaint  Pain in Stomach - Anorexia

History  Pneumonia - Influenza - Broncho-pneumonia at various periods throughout life

I. CLINICAL CONDITION

(a) At Commencement

<table>
<thead>
<tr>
<th>Date</th>
<th>Temp. Range</th>
<th>Pulse</th>
<th>Sputum</th>
<th>T.B.</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>21.11.24</td>
<td>97-100.6</td>
<td>100-110</td>
<td>n/a</td>
<td>n/a</td>
<td>L.S</td>
</tr>
</tbody>
</table>

(b) At termination

<table>
<thead>
<tr>
<th>Date</th>
<th>Temp. Range</th>
<th>Pulse</th>
<th>Sputum</th>
<th>T.B.</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>23.12.24</td>
<td>99-101</td>
<td>100-110</td>
<td>n/a</td>
<td>n/a</td>
<td>W</td>
</tr>
</tbody>
</table>

II. SPIROMETRY.

<table>
<thead>
<tr>
<th>Vital Capac.</th>
<th>22/11</th>
<th>6/12</th>
<th>15/12</th>
<th>Normal 1/1.9.35</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>900</td>
<td>840</td>
<td>820</td>
<td>2365</td>
</tr>
</tbody>
</table>

% of normal - 61.9; % change during treatment = -8.8

Weight: 5.94, 5.9, 5.8, 5.63

Percentage Change - 3.8
CASE. (64)

Sex F Age 40 Occup. House-maid Admitted 12.12.24

Complaint Cough, Sputum, Hoarseness

History 3 years ago - Planning left lung when cough and sputum began.

I. CLINICAL CONDITION

(a) At Commencement

Date 12.12.24
Temp. Range 98° - 102°
Pulse 100-110°
Sputum ++
T.B. ++
Assessment L25

(b) At termination

Date 16.1.25
Temp.-Range 94° - 101°
Pulse 100 - 110°
Sputum ++
T.B. ++
Assessment W.
Work Capacity /\n
PROGRESS Retrospection from beginning

II. SPIROMETRY

Chest Circum. Stem length Surf. Area
Class C 28 3/4" 33 1/4" 1.4 Sq. inches

\[
\begin{align*}
\text{Date} & : 12/12/24 & 30/12/24 & 10/12/24 \\
\text{Vital Capac} & : 1550 & 1500 & 1450 \\
\text{Normal V.C} & : 2796
\end{align*}
\]

% of normal - 44.6; % change during treatment. z - 4.5

\[
\begin{align*}
\text{Date} & : 12/12 & 8/4 \\
\text{Weight} & : 4'4" & 7'0" \\
\end{align*}
\]

Percentage Change - 3.1
**CASE (65)**

Sex F  Age 24  Occup. Housewife  Admitted  7.11.24

**Complaint**  Cough, Sputum, Pain in back

**History**  Dullishness, onset 4 months ago

---

**I. CLINICAL CONDITION**

(a) **At Commencement**

Date  4.11.24

- **Temp. Range**  97° - 102°
- **Pulse**  1300
- **Sputum**  3v
- **T.B.**  +
- **Assessment**  L2 S

(b) **At termination**

Date  31.12.24

- **Temp.-Range**  97° - 99.4°
- **Pulse**  95 - 100
- **Sputum**  3v
- **T.B.**  +
- **Assessment**  W.

**Work Capacity**

**PROGRESS**  Rapid decline

---

**II. SPIROMETRY.**

- **Class C**

<table>
<thead>
<tr>
<th>Date</th>
<th>Vital Capac.</th>
<th>2700, 2100, 2050,</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% of normal</td>
<td>20.5; % change during treatment.</td>
</tr>
<tr>
<td></td>
<td>Weight</td>
<td>8.4, 8.4, 8.3, 8.3</td>
</tr>
</tbody>
</table>

**Percentage Change**  -1.3%
CASE (66)


Complaint Spitting blood.

History 8 weeks - tiredness - slight cough - fit.

I. CLINICAL CONDITION
(a) At Commencement

Date 2.12.24
Temp. Range 94.4-98.6
Pulse 90
Sputum -
T.B. -
Assessment 2.5

(b) At termination

Date 16.1.25
Temp. Range 97.2-98.2
Pulse 80
Sputum +
T.B. neg
Assessment 1

Work Capacity

PROGRESS
Oscillations of Temp & Pulse.

II SPIROMETRY.

<table>
<thead>
<tr>
<th>Class</th>
<th>Chest Circum.</th>
<th>Stem length</th>
<th>Surf. Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>28 2/8</td>
<td>32 3/8</td>
<td>1.35 5/m</td>
</tr>
</tbody>
</table>

\[
\begin{align*}
\text{Vital Capac.} &: \frac{2130}{192} \frac{22.40}{190} \frac{2280}{192} \\
\text{Date} &: 2.12.24, 16.1.25 \\
\text{Weight} &: 4.12, 8.02, 8.12, 8.12
\end{align*}
\]

% of normal -92.4; % change during treatment: +6.0

Percentage Change +2.2
CASE (67)

Sex  Age  30  Occup.  Clerk  Admitted  3.9.24
Complaint  Cough, spik, Tiredness, night sweats.
History  1918 Pleurisy 'left side', 1922 cough relit began.

I. CLINICAL CONDITION
   (a) At Commencement
   Date  3.9.24
   Temp. Range  afebrile
   Pulse  80
   Sputum  +
   T.B.  +
   Assessment  2
   (b) At termination
   Date  19.12.24
   Temp.-Range  afebrile
   Pulse  80-90
   Sputum  +
   T.B.  +
   Assessment  1
   Work Capacity  

PROGRESS  Fair.

II SPIROMETRY.

<table>
<thead>
<tr>
<th>Class</th>
<th>Chest Circum.</th>
<th>Stem length</th>
<th>Surf. Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>29.8&quot;</td>
<td>33 3/8</td>
<td>1.49 sq. ft.</td>
</tr>
</tbody>
</table>

Date
Vital Capac. 2500, 2430, 2520, 2550, 2650, 2680
% of normal -16.6; % change during treatment +3.0

Date
Weight 6.13, 7.7, 7.6, 7.8, 8.1, 8.2, 8.2, 8.4
Percentage Change +20.3
CASE 68

Sex F  Age 19  Occ. Machinist  Admitted 23-7-24

Complaint Cough, Sputum, Breathlessness, Hoarseness

History 4 months ago cough & sputum began after a "Cold"

I. CLINICAL CONDITION

(a) At Commencement

Date 23-7-24

Temp. Range 97.6-99.8

Pulse 100-105

Sputum 3+iv

T.B. +

Assessment 2.8

(b) At termination

Date 25-12-24

Temp. Range 96.4-98.6

Pulse 100

Sputum 3.5

T.B. +

Assessment 1

Work Capacity

PROGRESS Decl.

II. SPIROMETRY.

Chest Circum. Stem length Surf. Area

<table>
<thead>
<tr>
<th>Class</th>
<th>28&quot;</th>
<th>32 2/8</th>
</tr>
</thead>
</table>

ARTIFICIAL PNEUMOTHORAX

<table>
<thead>
<tr>
<th>Date</th>
<th>Vital Capac.</th>
<th>SEE TEXT pp.</th>
</tr>
</thead>
</table>

% of normal -24.5 ; % change during treatment

Date 7/3 8/3 9/3 10/3 11/3 12/3 14/3 15/3 16/3 17/3 18/3 19/3 20/3 21/3 22/3 23/3 24/3 25/3 26/3 27/3 28/3 29/3 30/3 31/3

Weight 2.3 2.5 2.6 2.7 2.8 2.9 3.0 3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8 3.9 4.0 4.1 4.2 4.3 4.4 4.5 4.6 4.7 4.8 4.9 5.0 5.1 5.2 5.3 5.4

Percentage Change
CASE (69)

Sex M Age 37 Occu. Teacher Admitted 16.12.24

Complaint Cough, spit, tiredness, loss of weight

History Cough, spit began insidiously

I. CLINICAL CONDITION
   (a) At Commencement
   Date 16.12.24
   Temp. Range 97.8 - 99.8
   Pulse 100 - 105
   Sputum Z
   T.B. +
   Assessment L25

   (b) At termination
   Date 16.1.25
   Temp.-Range afebrile
   Pulse 90
   Sputum Z
   T.B. +
   Assessment M1
   Work Capacity

PROGRESS v. good after first fortnight.

II SPIROMETRY. Chest Circum. Stem Length
               33 3/8, 35 3/8
               [Class A]

   Date Vital Capac. Computed Normal
   1/2 16 1 4/1.31
   2800, 3250

   % of normal -46.4 ; % change during treatment.
   = 16.1

   Date Weight
   15 12 2 8/7 15
   9.12, 9.10, 9.13, 10.2

   Percentage Change +2.2
CASE (70)

Sex F  Age 36  Occup. Housewife  Admitted 2.12.25

Complaint  Cough, Sputum, tiredness, night sweats

History  Always been delicate. Bronchitis at 5 years old. July 1924 - Recurrent attack.

I. CLINICAL CONDITION

(a) At Commencement

<table>
<thead>
<tr>
<th>Date</th>
<th>Temp. Range</th>
<th>Pulse</th>
<th>Sputum</th>
<th>T.B.</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.12.24</td>
<td>97.2-99.9</td>
<td>100-105</td>
<td>3</td>
<td>+</td>
<td>L2S</td>
</tr>
</tbody>
</table>

(b) At termination

<table>
<thead>
<tr>
<th>Date</th>
<th>Temp. Range</th>
<th>Pulse</th>
<th>Sputum</th>
<th>T.B.</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>16.1.25</td>
<td>97.4-98.4</td>
<td>90</td>
<td>1</td>
<td>+</td>
<td>S</td>
</tr>
</tbody>
</table>

II. SPIROMETRY

Class A  Chest Circum. Stem length Surf. Area 25 28 32 8 1.29 sq. in.

<table>
<thead>
<tr>
<th>Date</th>
<th>Vital Capac.</th>
<th>% of normal</th>
<th>% change during treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.12</td>
<td>1750, 1820, 1760</td>
<td>-32.5</td>
<td>+16</td>
</tr>
</tbody>
</table>

| Weight     | 6.5, 6.8, 6.8, 6.9, 6.11 | 8.1 |

Percentage Change +8.1
CASE (71)

Sex F Age 35 Occup. Maid
Admitted 19.12.24

Complaint - Pain left side of chest - Cough - Tiredness

History 10 years ago - Malaria; 2 years ago Pneumonia & pneumonia left side - also Malaria

I. CLINICAL CONDITION

(a) At Commencement

Date 19.12.24
Temp. Range 97.4 - 99.6
Pulse 95
Sputum 
T.B. 
Assessment L28

(b) At termination

Date 16.1.25
Temp-Ranget afebrile
Pulse 80
Sputum 
T.B. 
Assessment M I
Work Capacity

PROGRESS - Good after abatement of systemic disturbance from 13th week

II. SPIROMETRY

Class C

<table>
<thead>
<tr>
<th>Chest Circum.</th>
<th>Stem length</th>
<th>Surf. Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>27 3/4&quot;</td>
<td>31 3/4&quot;</td>
<td>1.22 sq.m.</td>
</tr>
</tbody>
</table>

\[
\begin{align*}
\text{Date} &: 19/12/24, 16/12/24, 16/12/24 & \text{Compared Norm.} &: 24.41
\\
\text{Vital Capac.} &: 1550, 1800
\\
\text{% of normal} &: -36.5 & \% change during treatment. &: 2 + 16
\\
\text{Weight} &: 46.2, 46.2, 47.3 & \text{Percentage Change} &: +8.1
\end{align*}
\]
CASE (12)

Sex F Age 29 Occup.

Complaint Tiredness - debility - weight loss

History "Influenza 6 weeks ago since when cough and slight fever have persisted

I. CLINICAL CONDITION

(a) At Commencement

Date 16.12.24
Temp. Range 99.8 - 99.9
Pulse 90-95
Sputum ++
T.B. "observation"
Assessment 1.1

(b) At termination

Date 16.1.25
Temp. Range 97.6 - 98.8
Pulse 90
Sputum -
T.B. -
Assessment I (confirmed as Pum. Tub)
Work Capacity

PROGRESS

- Daily oscillations of Temp. Pulse

II SPIROMETRY.

Chest Circum. Stem length Surf. Area

<table>
<thead>
<tr>
<th>Class</th>
<th>3</th>
<th>3.8</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>Vital Capac.</th>
<th>Computed Normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2</td>
<td>2700</td>
<td>3265</td>
</tr>
<tr>
<td>1/2</td>
<td>2800</td>
<td></td>
</tr>
</tbody>
</table>

% of normal -17.2; % change during treatment +3.5

Weight

1/2 7.7 1 7.6 1 7.8 4.8

Percentage Change +11.6
CASE (73)

Sex F  Age 41  Occup. Housewife  Admitted 15.12.24

Complaint. Debility  Night sweating, Cough, Spil.

History 13 years ago. Bronchitis & Pleurisy (Right)
5 weeks ago recurrence of Bronchitis

I. CLINICAL CONDITION

(a) At Commencement

<table>
<thead>
<tr>
<th>Date</th>
<th>Temp. Range</th>
<th>Pulse</th>
<th>Sputum</th>
<th>T.B.</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.12.24</td>
<td>97°-100°</td>
<td>85-100</td>
<td></td>
<td></td>
<td>L.S</td>
</tr>
</tbody>
</table>

(b) At termination

<table>
<thead>
<tr>
<th>Date</th>
<th>Temp. Range</th>
<th>Pulse</th>
<th>Sputum</th>
<th>T.B.</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>16.1.25</td>
<td>94.6-98.8°</td>
<td>80-90</td>
<td></td>
<td></td>
<td>I</td>
</tr>
</tbody>
</table>

Work Capacity

PROGRESS

For first few weeks no progress

then improving

II SPIROMETRY. Chest Circum. Stem length Surf. Area

<table>
<thead>
<tr>
<th>Chest Circum.</th>
<th>Stem length</th>
<th>Surf. Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>32⅛&quot;</td>
<td>1 29 sq.in</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>Vital Capac.</th>
<th>% of normal</th>
<th>Change during treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>15/12</td>
<td>1500</td>
<td>259.4</td>
<td>-26.7;  +2.6</td>
</tr>
<tr>
<td>16/12</td>
<td>1600</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19/50</td>
<td>1900</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Weight

<table>
<thead>
<tr>
<th>Date</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.13</td>
<td>6.14</td>
</tr>
<tr>
<td>4.13</td>
<td>4.14</td>
</tr>
<tr>
<td>7.2</td>
<td></td>
</tr>
</tbody>
</table>

Percentage Change +3.6
CASE (74)

Sex: F  Age: 19  Occup.: Domestic  Admitted: 21.6.24

Complaint: Cough (dry), Pain epigastric region

History: Pneumonia three in childhood
Epigastric pain for 3 years.

I. CLINICAL CONDITION

(a) At Commencement

Date: 21.8.24
Temp. Range: 39.8 - 98.8
Pulse: 80
Sputum: -
T.B.: -
Assessment: Observation

(b) At termination

Date: 16.1.25
Temp. Range: 39.4 - 98.6
Pulse: 80
Sputum: -
T.B.: -
Assessment: Confirmed Pulmonary
Work Capacity: /

PROGRESS: Continued oscillations of Temp. & Pulse yet no physical signs till

II. SPIROMETRY. Chest Circum. Stem length Surf. Area

Class C 28.3" 32.0" 1.28 sq.in.

\[
\begin{array}{cccccccc}
\text{Date} & 21/8 & 6/9 & 23/9 & 13/10 & 27/10 & 10/11 & 3/12 & 15/12 \\
\text{Vital Capac.} & 2050 & 2120 & 2120 & 2100 & 2200 & 2100 & 2150 & 2100 \\
\end{array}
\]

% of normal: -20.7; % change during treatment.

\[
\begin{array}{cccccccc}
\text{Date} & 4/9 & 15/9 & 1/10 & 8/10 & 13/10 & 3/11 & 7/12 & 15/12 & 3/12 & 16/12 \\
\text{Weight} & 8.7 & 8.7 & 8.7 & 8.8 & 8.9 & 8.9 & 8.9 & 8.9 & 8.9 & 8.9 \\
\end{array}
\]

Percentage Change: 3.4
CASE (75)

Sex F  Age 23  Occup. Rubber Worker  Admitted 17.4.24

Complaint  Pain in back, Night Sweat, Cough - Spit

History  June 1919, Influenza, since when has had cough & spit intermittently

I. CLINICAL CONDITION

(a) At Commencement

Date 21.8.25
Temp. Range 99.2 - 99.9
Pulse 80-90
Sputum 3+ T.B.  neg
Assessment

(b) At termination

Date 16.1.25
Temp. Range 99.4 - 98.8
Pulse 80-90
Sputum 3+ T.B.  neg
Assessment L/I M/I

Work Capacity

PROGRESS  variable - oscillating Temp. & Pulse

II. SPIROMETRY.  Chest Circum. Stem length Surf. Area

\[
\begin{array}{cccc}
\text{Class} & \text{C} & \text{Surf. Area} & 1.20 \text{sq. m} \\
\text{Vital Capac.} & 24 & 18 & 1950, 1950, 1900, 2000, 2050, 1900 \\
% \text{of normal} & -24.9 & \% \text{change during treatment} & 5+4.6 \\
\text{Weight} & 78, 84, 94, 9, 7.9, 7.10, 7.8, 7.1, 7.2 & \%
\end{array}
\]

Percentage Change  - 0.47
CASE (76)

Sex F Age 38 Occup. Housewife  Admitted 9.10.24

Complaint Cough, Sputum, Pain - occasional streaking

History 6 months ago - influenza which left her weakened.

I. CLINICAL CONDITION

(a) At Commencement

Date 9.10.24
Temp. Range 97.9-98.6
Pulse 80-90
Sputum ++
T.B. +
Assessment Las

(b) At termination

Date 31.12.24
Temp Range afebrile
Pulse 80-90
Sputum ml
T.B. +
Assessment M.I.
Work Capacity /

PROGRESS  very good  continuous progress.

II. SPIROMETRY. Chest Circum. Stem length Surf. Area

<table>
<thead>
<tr>
<th>Class</th>
<th>Chest Circum.</th>
<th>Stem length</th>
<th>Surf. Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>29 3/8&quot;</td>
<td>33 3/8&quot;</td>
<td>1.42 ft.</td>
</tr>
</tbody>
</table>

Date \{\frac{10}{10}, \frac{24}{10}, \frac{22}{11}, \frac{14}{2} \} \text{Computed Normal 2854}

\% of normal -28\% ; \% change during treatment. +15.3

Date \{\frac{10}{10}, \frac{15}{10}, \frac{20}{10}, \frac{25}{10}, \frac{27}{12} \}

Weight \{80, 84, 88, 85, 87, 89, 90\}

Percentage Change +15.6
CASE (77)

Sex F  Age 38  Occup. Housewife  Admitted 23.8.24

Complaint Cough, Sput., Pain left side, Breathlessness, hemozy. Suddenness

History 3 years ago Cough + Sput. began  Pulmonary left side.

I. CLINICAL CONDITION

(a) At Commencement

Date 23.8.24
Temp. Range 98°-99.2°
Pulse 90-100
Sputum 3
T.B. +
Assessment 2.3.8

(b) At termination

Date 31.12.24
Temp. Range 98.8-99°
Pulse 90-100
Sputum 3
T.B. +
Assessment S

PROGRESS - No progress - frequent relapses

II SPIROMETRY. Chest Circum. Stem length Surf. Area

Class C

\[
\text{Date} \quad \frac{23}{8} \quad \frac{5}{8} \quad \frac{11}{4} \quad \frac{19}{10} \quad \frac{24}{10} \quad \frac{21}{11} \quad \frac{19}{12}
\]

\[\text{Weight} \quad 4.7, 4.9, 4.11, 4.11, 7.13, 8.0, 8.1, 8.2, 2.5\]

\[\text{Percentage Change} \quad +9.5\]

\[\text{Date} \quad 23.8.24 \quad 5.9 \quad 11.10 \quad 21.11 \quad 19.12 \]

\[\text{Vital Capac.} \quad 1830, 1480, 1500, 1540, 1570, 1560, 1560\]

% of normal -42.9; % change during treatment. +1.9
CASE (48)

Sex: F  Age: 22  Occup.: Nurse  Admitted: 3.9.24

Complaint: Cough, Spit, Breathlessness, Haemoptysis

History: Cough & Spit for years.
June 23, 1924 - Haemoptysis - since then cough & spit have troublesome

I. CLINICAL CONDITION

(a) At Commencement

Date: 3.9.24
Temp. Range: 97.8 - 99.4
Pulse: 80 - 90
Sputum: +
T.B.: +
Assessment: L.3.

(b) At termination

Date: 16.1.25
Temp.-Range: 97.8 - 99.8
Pulse: 90 - 100
Sputum: +
T.B.: +
Assessment: W.
Work Capacity: (gradual decline)

PROGRESS

II. SPIROMETRY.

Class III.

Chest Circum. Stem length Surf. Area

29.0"  31 7/8"  1.4" Sc.m.

Vital Capac.:

<table>
<thead>
<tr>
<th>Date</th>
<th>3/4</th>
<th>1/4</th>
<th>1/4</th>
<th>4/8</th>
<th>1/4</th>
<th>1/4</th>
<th>1/4</th>
</tr>
</thead>
<tbody>
<tr>
<td>2050</td>
<td>2000</td>
<td>2100</td>
<td>2060</td>
<td>1980</td>
<td>1850</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

% of normal: -29.0%; change during treatment: -9.7

Date: 8.9, 8.2, 8.1, 8.0, 8.0, 7.13, 8.4, 8.7.
Weight: 8.2, 8.4, 8.6, 8.8, 8.8, 8.1, 8.1, 8.2.

Percentage Change: -0.8
CASE (79)

Sex F  Age 13  Occup. School  Admitted 19.6.24

Complaint  Stomach pain, Cough, Spit

History  March, 1924: "Influenza"  Has had a weak chest since infancy

I. CLINICAL CONDITION

(a) At Commencement

Date  3.9.24
Temp. Range  98°-99.2°
Pulse  80-90
Sputum  Z
T.B.  neg.
Assessment  125

(b) At termination

Date  16.1.25
Temp. Range  97.4°-98.8°
Pulse  80-90
Sputum  Z
T.B.  neg.
Assessment  S
Work Capacity

PROGRESS  varied. acute Right Pleurisy. pneumonia 25%

II. SPIROMETRY

Chest Circum. Stem length Surf. Area

Chns C.  24 7/8"  27 5/8"  92 sq. cm

<table>
<thead>
<tr>
<th>Date</th>
<th>Vital Capac.</th>
<th>% of normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/9</td>
<td>14,420</td>
<td>14.7</td>
</tr>
<tr>
<td>9/9</td>
<td>14,800</td>
<td>15.0</td>
</tr>
<tr>
<td>10/9</td>
<td>15,000</td>
<td>15.2</td>
</tr>
<tr>
<td>11/9</td>
<td>15,800</td>
<td>16.0</td>
</tr>
<tr>
<td>12/9</td>
<td>13,300</td>
<td>13.4</td>
</tr>
</tbody>
</table>

% change during treatment = -1.4

<table>
<thead>
<tr>
<th>Date</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/10</td>
<td>5.7</td>
</tr>
<tr>
<td>14/10</td>
<td>5.8</td>
</tr>
<tr>
<td>15/10</td>
<td>5.8</td>
</tr>
<tr>
<td>16/10</td>
<td>5.6</td>
</tr>
<tr>
<td>17/10</td>
<td>5.9</td>
</tr>
<tr>
<td>18/10</td>
<td>5.8</td>
</tr>
</tbody>
</table>

Percentage Change  +8.3

* Fall. from Pneumonic Attack
CASE (80)

Sex F  Age 46  Occup.  nil  Admitted 19.11.24

Complaint  Tiredness  Pain in back.

History  When 9 yrs old had excision of cervical gland 1916 another operation as above.

I. CLINICAL CONDITION

(a) At Commencement

Date  19.11.24
Temp. Range  afebrile
Pulse  70–80
Sputum  nil
T.B.  
Assessment  Observation

(b) At termination

Date  18.1.25
Temp. Range  afebrile
Pulse  70–80
Sputum  nil
T.B.  
Assessment  (Not Pula Tuba) m.I.

Work Capacity  

PROGRESS  very good

II SPIROMETRY

Class C  Chest Circum. Stem length Surf. Area

<table>
<thead>
<tr>
<th>Date</th>
<th>2/11</th>
<th>5/12</th>
<th>1/12</th>
<th>10/10</th>
<th>Computed Normal 2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vital Capac.</td>
<td>2380, 2420, 2450, 2450</td>
<td>% of normal ≈ 85% ; % change during treatment: +2.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>2/11</td>
<td>5/12</td>
<td>1/12</td>
<td>5/15</td>
<td>4/12, 4/10, 4/10, 4/11²</td>
</tr>
</tbody>
</table>

Percentage Change +0.45
CASE (81)

Sex F Age 22 Occup. Service Admitted 4.4.24
Complaint Tiredness, Anorexia, Cough, Spat
History Dec 1923- Influenza when Cough. 3rd began
Dec family history

I. CLINICAL CONDITION
(a) At Commencement
Date 3.9.24
Temp. Range 97.8 - 99.8
Pulse 80 - 90
Sputum 3 ml
T.B. neg.
Assessment L, S

(b) At termination
Date 16.1.25
Temp.-Range 99.6-101°
Pulse 90 - 100
Sputum 3 ml
T.B. neg. (on 10 occasions)
Assessment N

Work Capacity

PROGRESS
Unsatisfactory Temp & Pulse oscillating
Frequent B. cases

II. SPIROMETRY.
Chest Circum. Stem length Surf. Area
Class C

\[
\text{Date} \quad 3/9 \quad 14/10 \quad 24/10 \quad 5/11 \quad 12/12 \quad 12/13
\]

\[
\text{Vital Capac.} \quad 1750, 1820, 1850, 1800, 1980, 1750, 1700
\]

\[
\% \text{ of normal} = 26.0 \% \text{ change during treatment}
\]

\[
\text{Date} \quad 4.9 \quad 18.7 \quad 9.10 \quad 2.10 \quad 2.11 \quad 7.12 \quad 5/12 \quad 5/17 \quad 15/17
\]

\[
\text{Weight} \quad 6.8, 6.9, 6.8, 6.7, 6.6, 6.7, 6.9, 6.7
\]

Percentage Change - 2.1
CASE (82)

Sex F  Age  40  Occup.  Housewife  Admitted  13.11.24

Complaint  Cough, Haemoptysis, Haematuria, Right Sweating

History  Cough, sputum began after a 'cold' 3 years ago

I. CLINICAL CONDITION

(a) At Commencement

Date  12.11.24
Temp. Range  97° - 104°
Pulse  100-120
Sputum  +
T.B.  +
Assessment  L 2 5

(b) At termination

Date  16.1.25
Temp-Range  94°-103°
Pulse  100-120
Sputum  +
T.B.  +
Assessment  W

Work Capacity

PROGRESS

RAPID DEATH - complicated by DIABETES.

Treated by Insulin.

II SPIROMETRY

Chest Circum. Stem length  Surfac. Area

\[ \text{Chest Circum.} \quad 29 \frac{3}{8}'' \quad 32 \frac{5}{8}'' \quad 1.36 \text{ sq. m.} \]

\[ \text{Vital Capac.} \quad 1200, 1350, 1240, 1160 \]

\[ \text{Computed Normal} \quad 2744 \]

% of normal  - 53.5  ; % change during treatment  - 11.3

Weight \[ q, q \{, q, q \}, q \{, q \}, q, q \}

Percentage Change  - 10.2
CASE (83)

Sex F Age 33 Occup. House Admitted 21-10-24

Complaint Cough, Sputum, Haemoptysis, Pulitation

History During last 2 years frequent Colds also occasional streaking in Sputum

I. CLINICAL CONDITION

(a) At Commencement

Date 21-10-24
Temp. Range 94.8-98.8°
Pulse 80-100
Sputum ml
T.B. -
Assessment L.8

(b) At termination

Date 16-1-25
Temp. Range 97.4-99°
Pulse 80-100
Sputum ml
T.B. -
Assessment S

Work Capacity

PROGRESS - no change. Temp & Pulse oscillating

II. SPIROMETRY.

Chest Circum. Stem length Surf. Area

Class A 28.8" 32.8" 1.56 sq."

Date \{ Vital Capac. \}
\{ 2500, 2450, 2580, 2600 \} 28.8"
% of normal - 20.1 ; % change during treatment. + 4.0

Date \{ Weight \}
\{ 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 \}
Percentage Change + 1.8
CASE (84)

Sex F Age 10 Occup. School Admitted 15.12.24

Complaint Tiredness Pain = swelling right side of Neck.

Cough

History 3 years ago - Cough began after measles

I. CLINICAL CONDITION

(a) At Commencement

Date 15.12.24
Temp. Range 97.6 - 98.8°
Pulse 80 - 90
Sputum µl
T.B. /
Assessment H/S + adenitis (lens)

(b) At termination

Date 16.1.25
Temp-Range 97.6 - 98.4°
Pulse 80 - 90
Sputum µl
T.B. /
Assessment I

Work Capacity

II SPIROMETRY.

Chest Circum. Stem length Surf. Area

<table>
<thead>
<tr>
<th>Class C</th>
<th>25.0&quot;</th>
<th>27.8&quot;</th>
<th>.94 sq.m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>15.12</td>
<td>16.12</td>
<td></td>
</tr>
<tr>
<td>Vital Capac.</td>
<td>159</td>
<td>147</td>
<td></td>
</tr>
<tr>
<td>Of normal</td>
<td>-16.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% change during treatment</td>
<td>+8.3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Percentage Change +8.3
Sex F  Age 14  Occup. School  Admitted 4.12.24
Complaint  Deafness, Pain left side
History  3 months ago began to lose weight and became listless

I. CLINICAL CONDITION
(a) At Commencement
Date  4.12.24
Temp. Range 94.8 - 99°
Pulse 80 - 90
Sputum ml
T.B.
Assessment 2,8

(b) At termination
Date  16.1.25
Temp. Range afebrile
Pulse 70 - 80
Sputum ml
T.B.
Assessment M.I
Work Capacity

PROGRESS  very good after first week

II SPIROMETRY

<table>
<thead>
<tr>
<th>Class</th>
<th>Chest Circum.</th>
<th>Stem length</th>
<th>Surf. Area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>26 3/8&quot;</td>
<td>29.0&quot;</td>
<td>1.03 sq. m.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>Vital Capac.</th>
<th>12</th>
<th>12</th>
<th>12</th>
<th>Computed normal 20 92</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1650, 1480, 2000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>% of normal - 21.1 ; % change during treatment + 21.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>Weight</th>
<th>12</th>
<th>12</th>
<th>12</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5.12, 6.0, 6.2, 6.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Percentage Change + 10.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


CASE (86)

Sex F Age 24 Occup. Nurse Admitted 6.11.24

Complaint Cough, Sputum, Night Sweating, Tiredness

History 2 years ago cough and sputum began after a cold, have continued since.

I. CLINICAL CONDITION

(a) At Commencement

Date 6.11.24
Temp. Range 98 - 98.8°
Pulse 80 - 90
Sputum +
T.B. neg.
Assessment 2.1

(b) At termination

Date 16.1.25
Temp. Range afebrile
Pulse 70 - 80
Sputum +
T.B. neg.
Assessment 1
Work Capacity

II. PROGRESS

SPIROMETRY

Chest Circum. Stem length Surf. Area
27 1/8" 30 1/8" 1.18 sq. ft.

Vital Capac. 1850, 1920, 1980, 2030, 2385

% of normal 22.4

% change during treatment +9.7

Weight
4.10, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6

Percentage Change +10.2
CASE (87)

Sex: F  Age: 24  Occup.: Housewife  Admitted: 3.9.24

Complaint: Cough, Sputum, Debility, Loss of Weight.

History: 2 years cough and began insidiously.

PREGNANT

I. CLINICAL CONDITION

(a) At Commencement

Date: 3.9.24
Temp. Range: 99.6 - 99.0
Pulse: 80 - 100
Sputum: +
T.B.: +
Assessment: L25

(b) At termination

Date: 27.12.24
Temp. Range: Afebrile
Pulse: 70 - 90
Sputum: -
T.B.: -
Assessment: M-I

Work Capacity: Good after first 2 months.

PROGRESS

II. SPIROMETRY.

Chest Circum. Stem length Surf. Area

<table>
<thead>
<tr>
<th>Class</th>
<th>Chest</th>
<th>Stem</th>
<th>Surf.</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>29.0</td>
<td>33.8</td>
<td>1.41</td>
</tr>
</tbody>
</table>

Vital Capac.

<table>
<thead>
<tr>
<th>Date</th>
<th>24.20</th>
<th>26.40</th>
<th>27.20</th>
<th>27.30</th>
<th>27.60</th>
<th>27.80</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of normal</td>
<td>20.9</td>
<td>% change during treatment: +14.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Weight

<table>
<thead>
<tr>
<th>Date</th>
<th>4.75</th>
<th>7.5</th>
<th>10.5</th>
<th>13</th>
<th>16</th>
<th>19</th>
<th>22</th>
<th>25</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of normal</td>
<td>16.8</td>
<td>Percentage Change: +16.5</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Date

W.P.

\[\begin{align*}
\text{Vital Capac.} & = & 24.20 & 26.40 & 27.20 & 27.30 & 27.60 & 27.80 \\
\% \text{ of normal} & = & 20.9 & \% \text{ change during treatment:} & +14.4 \\
\text{Weight} & = & 4.75 & 7.5 & 10.5 & 13 & 16 & 19 & 22 & 25 \\
\% \text{ of normal} & = & 16.8 & \% \text{ Percentage Change:} & +16.5
\end{align*}\]
Sex F Age 21 Occup. Clerkess Admitted 1.7.24
Complaint Pain left side, cough 8.7.24
History 18 months ago - left pleuritic pain, intermittent since Feb 1924 - influenza

I. CLINICAL CONDITION
(a) At Commencement
Date 18.8.24
Temp. Range 97.4-99.8
Pulse 88 - 100
Sputum +
T.B. Assessment type
Assessment L, S.

(b) At termination
Date 3-11-24
Temp.-Range 97.6-99.8
Pulse 100 - 120
Sputum +
T.B. Assessment W
Work Capacity

PROGRESS
Steady decline. On 26.10.24 Spontaneous Pneumothorax - displacing Mediastinum (see Top)

II SPIROMETRY

<table>
<thead>
<tr>
<th>Class</th>
<th>Chest Circum.</th>
<th>Stem length</th>
<th>Surf. Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>27.8</td>
<td>82.0</td>
<td>1.49 sq.m.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>Vital Capac.</th>
<th>% of normal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>188</td>
<td>26</td>
</tr>
<tr>
<td>20.50</td>
<td>200.0</td>
<td>1920</td>
</tr>
<tr>
<td>% change during treatment.</td>
<td>-31.2</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>Weight</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.6</td>
<td>0.45</td>
<td>-13.5</td>
</tr>
<tr>
<td>6.0</td>
<td>0.5</td>
<td>-17.5</td>
</tr>
<tr>
<td>6.4</td>
<td>0.7</td>
<td>-23.5</td>
</tr>
</tbody>
</table>
CASE (89)

Sex: F  Age: 28  Occup: Clerkess  Admitted: 7.7.24

Complaint: Cough, Spitz, Tiredness, Swollen Generalized

History: Clinical fluid since childhood - Feb. 1924  Cough & fit began

I. CLINICAL CONDITION
(a) At Commencement
Date: 18.8.25
Temp. Range: 9.4-9.8
Pulse: 80-90
Sputum: 3
T.B.: +
Assessment: H2S

(b) At termination
Date: 13.12.24
Temp. Range: 9.4-9.9
Pulse: 80-90
Sputum: 3
T.B.: +
Assessment: S

PROGRESS

Work Capacity

-II SPIROMETRY-

Chest Circum. Stem length Surf. Area

Class A (athletic)

Date: 28, 5.11, 13.3.24

% of normal: -24.4%; % change during treatment: -1.9

Date: 19.3, 9.4, 9.5, 9.5, 9.5, 9.5, 9.5, 9.4, 9.4
Weight: 2.8, 2.9, 2.8, 2.8, 2.9, 2.9, 2.9, 2.9, 2.9

Percentage Change: +1.7
CASE (90)

Sex F Age 28 Occup. Housewife Admitted 19.6.24

Complaint - Weakness - Cough - Sputum

History - Always delicate - has been in several sanatoria since 1912 - Family History very bad.

I. CLINICAL CONDITION

(a) At Commencement

Date 1.8.24
Temp. Range 98 - 101°
Pulse 80 - 110
Sputum +
T.B. +
Assessment L2 S

(b) At termination

Date 2.10.24
Temp.-Range 97.4 - 98.6°
Pulse 80 - 90
Sputum +
T.B. +
Assessment 1
Work Capacity - Rapid decline until pneumothorax (see text)

PROGRESS - Rapid decline until pneumothorax [see text]

II. SPirometry.

Chest Circum. Stem length Surf. Area

\[
\begin{align*}
\text{Date} & : 2.9.24, 31.3.24, 1.3.24 \\
\text{Vital Capac.} & : \text{Artificial Pneumothorax performed (see text)} \\
\text{Weight} & : 6.7, 6.15, 6.10, 6.13 \\
\text{Percentage Change} & : \%
\end{align*}
\]
Sex F Age 24 Occup. Nurse Admitted 9.11.23
Complaint Cough, Sputum - Pain left side
History 06.1923. Pleurisy left side after admission after
I. CLINICAL CONDITION
(a) At Commencement
Date 13.8.24
Temp. Range 97.6 - 99.8
Pulse 80 - 110
Sputum 3
T.B. +
Assessment 2.2
(b) At termination
Date 23.10.24
Temp-Range 98.0 - 99.9
Pulse 80 - 90
Sputum 3
T.B. +
Assessment 1
Work Capacity
II. SPIROMETRY.
Chest Circum. Stem length Surf. Area
Class A
{ Date
Vital Capac. 
See Text. - Table 111
% of normal 56.2 ; % change during treatment.
Date 3/4, 3/7, 4/7, 4/11, 5/9, 6/0, 6/5, 6/8
Weight 4.4, 4.4, 4.4, 4.4, 8.0, 8.5, 8.6
Percentage Change
CASE (92)

Sex: F Age: 16 Occup.: Shop Ass.; Admitted: 25.8.24

Complaint: Cough, Sputum, debility

History: Cough + Sputum since infancy.

I. CLINICAL CONDITION

(a) At Commencement

Date: 25.8.24
Temp. Range: 99.6 - 99°
Pulse: 80 - 90
Sputum: ++
T.B.: +
Assessment: H2.5

(b) At termination

Date: 12.12.24
Temp. Range: Afebrile
Pulse: 70 - 80
Sputum: ++
T.B.: +
Assessment: M. I

Work Capacity

II. SPIROMETRY

Chest Circum. Stem length Surf. Area
Class C 27 8 31 6

Date
Vital Capac. 
11 9 4 11 11 9 11 11 6 11 11 6 11 11 6 11 11 6
% of normal: -24.3; % change during treatment: +5.1

Date
Weight: 11 8 11 8 11 8 11 8 11 8 11 8 11 8 11 8 11 8 11 8
Percentage Change: +15.2
CASE (93)

Sex: F  Age: 30  Occup.: Shop Assistant  Admitted: 13.5.24

Complaint: Cough, Sputum, Tightness in Chest, Attack of Breathlessness

History: Pleural when 12 years old - Cough since 1905, Pleurisy on 4 occasions - Recurrent Bronchitis

I. CLINICAL CONDITION

(a) At Commencement

Date: 18.8.24
Temp. Range: 97.4 - 99°
Pulse: 80 - 100
Sputum: Z
T.B.: +
Assessment: L2.8

(b) At termination

Date: 15.11.24
Temp. Range: 98 - 99.6°
Pulse: 80 - 100
Sputum: Z
T.B.: +
Assessment: S

Work Capacity

PROGRESS

- None - Recurrent attacks of Bronchitis

II. SPIROMETRY.

Class: B

<table>
<thead>
<tr>
<th>Date</th>
<th>Vital Capac.</th>
<th>Chest Circum.</th>
<th>Stem length</th>
<th>Surf. Area</th>
<th>Computed Home</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>Weight</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>22.60, 23.00, 23.20, 23.00, 22.80,</td>
<td>29.0&quot;</td>
<td>33.5</td>
<td>1.54</td>
<td>30.46</td>
</tr>
</tbody>
</table>

% of normal: 26.1; % change during treatment: +1.3.

Percentage Change: -8.7.
CASE (94)

Sex F  Age 21  Occup. Shop assistant  Admitted 9.10.24

Complaint  Cough, Sputum, Dyspnoea

History  3 months ago Haemoptysis when cough and sputum began

I. CLINICAL CONDITION

(a) At Commencement

Date 9.10.24
Temp. Range 97.4-98.8°
Pulse 70-90
Sputum ml
T.B. / Assessment h28

(b) At termination

Date 26.12.24
Temp.-Range afebrile
Pulse 70-80
Sputum ml
T.B. / Assessment m. I
Work Capacity

PROGRESS

v. good after first 2 weeks. No. Haemoptysis

II SPIROMETRY.

Chest Circum. Stem length Surf. Area

Class C  27.0"  31.0"  1.19 sq.m

Date Vital Capac. 1950, 1920, 1840, 2020, 2060

% of normal - 26.0 ; % change during treatment

Date Weight 8.0, 8.0, 8.6, 8.7, 8.6, 8.4
Percentage Change + 5.9
**CASE. (95)**

**Sex**: Female  
**Age**: 21  
**Occup.**: House  
**Admitted**: 16.12.24

**Complaint**  
Debility - Pain Right Side of Chest - Anorexia

**History**  
2 years ago Fainting & Slight 4 weeks - 8 weeks ago cough & sputum - 6 weeks ago anaemia.

---

### I. CLINICAL CONDITION

**(a) At Commencement**

<table>
<thead>
<tr>
<th>Date</th>
<th>16.12.24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temp. Range</td>
<td>97-99.2</td>
</tr>
<tr>
<td>Pulse</td>
<td>80-90</td>
</tr>
<tr>
<td>Sputum</td>
<td>nil</td>
</tr>
<tr>
<td>T.B.</td>
<td>/</td>
</tr>
<tr>
<td>Assessment</td>
<td>L.5</td>
</tr>
</tbody>
</table>

**(b) At termination**

<table>
<thead>
<tr>
<th>Date</th>
<th>16.1.25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temp.-Range</td>
<td>97.6-98</td>
</tr>
<tr>
<td>Pulse</td>
<td>95-90</td>
</tr>
<tr>
<td>Sputum</td>
<td>nil</td>
</tr>
<tr>
<td>T.B.</td>
<td>/</td>
</tr>
<tr>
<td>Assessment</td>
<td>I</td>
</tr>
</tbody>
</table>

**Work Capacity**

---

### PROGRESS

No more haemoptysis but temp & pulse continue to oscillate daily.

---

### II. SPIROMETRY

<table>
<thead>
<tr>
<th>Chest Circum.</th>
<th>Stem length</th>
<th>Surf. Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>28 7/8&quot;</td>
<td>33 1/8&quot;</td>
<td>1.51 sq.m.</td>
</tr>
</tbody>
</table>

**Vital Capac.**

<table>
<thead>
<tr>
<th>Date</th>
<th>16/12</th>
<th>16/1</th>
</tr>
</thead>
<tbody>
<tr>
<td>24'50&quot;</td>
<td>26'20</td>
<td></td>
</tr>
</tbody>
</table>

Computed Normal 2981

% of normal -1°.8; % change during treatment +6.9

**Weight**

<table>
<thead>
<tr>
<th>Date</th>
<th>15/12</th>
<th>8/7</th>
</tr>
</thead>
<tbody>
<tr>
<td>5'12&quot;</td>
<td>5'2</td>
<td></td>
</tr>
</tbody>
</table>

Percentage Change +5.9
CASE (96)

Sex: F  Age: 19  Occup.: Clerkess  Admitted: 1/8/24

Complaint: Pain in chest, cough, sputum, tiredness

History: March 1924 rheumopt. May 1924 bronchitis probably had slight cough before that.

I. CLINICAL CONDITION
(a) At Commencement
Date: 18/8/25
Temp. Range: 94.8 - 99.8
Pulse: 80 - 110
Sputum: +
T.B.: +
Assessment: H3.8

(b) At termination
Date: 16/1/25
Temp. Range: 98 - 103
Pulse: 80 - 120
Sputum: +
T.B.: +
Assessment: W

Work Capacity: steady decline. Exacerbation 7/11/24. overview thorax attempted but pocket entered (see text).

II. SPIROMETRY.
Chest Circum. Stem length Surf. Area

Date: 15/3
Vital Capac.: 1400, 1500, 1600, 1700, 1800, 1900, 2000, 2100

% of normal: 30%; % change during treatment: 1.6%

Date Weight: 2/7, 4; 9/7, 52, 27/9, 31, 4/12, 12, 15/1
Percentage Change: -1.5%
CASE (97)

Sex F Age 47 Years Occu. House-wife Admitted 15.12.24

Complaint Cough - Sput - Tachy - Night Sweats - Splittin Blood

History Coughing for last 20 years - Occasional

I. CLINICAL CONDITION

(a) At Commencement

Date 15.12.24

Temp. Range 97.4 - 99.0
Pulse 70-90
Sputum Z III
T.B. neg
Assessment 12.5

(b) At termination

Date 16.1.25

Temp-Range 94.8 - 99.2
Pulse 70-90
Sputum Z III
T.B. neg
Assessment S

Work Capacity

PROGRESS

Temp & Pulse still oscillating.

II SPIROMETRY

Chest Circum. Stem length Surf. Area

Date Vital Capac. Computed Normal
15/12 19'00 18'00 18'00
19/12 18'00 18'00 18'00

% of normal - 30.8 ; % change during treatment

Date Weight
15/12 15'1 15'1
19/12 15'1 15'1
7.24' 4.24' 7.5

Percentage Change + 2.7
CASE (98)

Sex F  Age 28  Occup. Nurse - Maid  Admitted 10.3.24
Complaint Swollen neck glands - debility
History Since 1901 seven operations on glands of neck

I. CLINICAL CONDITION
(a) At Commencement
Date 21.8.25
Temp. Range 97.6 - 98.6
Pulse 80 - 90
Sputum - 3 +
T.B. neg.
Assessment Observation
Pulm Tub. + arm admit.
(b) At termination
Date 16.1.28
Temp - Range 94.8 - 98.4
Pulse 80 - 90
Sputum 
T.B. neg
Assessment Very probably neg. Pulm Tub
Work Capacity arm admit.

PROGRESS
Constant oscillations in Temp. & Pulse - diagnostic complication.

II SPANROMETRY
Chest Circum. Stem length Surf. Area
Class C

<table>
<thead>
<tr>
<th>Date</th>
<th>Vital Capac</th>
<th>% of normal</th>
<th>% change during treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>27/8</td>
<td>2300, 2350, 2350, 2400, 2400, 2350, 2450, 2400.</td>
<td>10.1</td>
<td>1.2 %</td>
</tr>
</tbody>
</table>

Weight

<table>
<thead>
<tr>
<th>Date</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>27/8</td>
<td>6.10, 6.10, 6.11, 6.18, 6.1, 7.1, 9.6, 7.0</td>
</tr>
</tbody>
</table>

Percentage Change +3.3.
CASE (99)

Sex: F  Age: 26  Occup.: Nurse  Admitted: 21/11/24

Complaint: Difficulty, Cough, Sputum, Pain left side

History: Since a child of 14 years has been subject to occasional attacks of pneumonia, influenza, men

I. CLINICAL CONDITION

(a) At Commencement

Date: 21/11/24
Temp. Range: 99.4-99.4
Pulse: 90-110
Sputum: +
T.B.: -
Assessment: I

(b) At termination

Date: 16/1/25
Temp. Range: 99.4-99.4
Pulse: 80-100
Sputum: -
T.B.: -
Assessment: I
Work Capacity: /

PROGRESS

No further haemoptysis but Temp and Pulse unstable.

II. SPIROMETRY

Date 23/11  15/12  16/1  26/12  24/0
Vital Capac. 22/4  25/3  24/0  24/0  24/0
% of normal -18.4  % change during treatment +5.9

Date 24/1  27/11  4/2  15/1  15/1
Weight 8.3  8.3  8.5  8.4
Percentage Change +3.5
**CASE (100)**

Sex F  Age 34  Occup.  Homemaker  Admitted 28. 8.24

Complaint: Pain right side, Cough, Sputum, Night Sweats.

History: Dec 1927, Pneumonia Pleurisy (Right), Recurrences on 2 occasions.

### I. CLINICAL CONDITION

**(a) At Commencement**

- **Date**: 28. 8. 24
- **Temp. Range**: 91.4 - 101.1°F
- **Pulse**: 80 - 100
- **Sputum**: +
- **T.B.**: +
- **Assessment**: L2S

**(b) At termination**

- **Date**: 16. 1. 25
- **Temp. Range**: 97.6 - 100°F
- **Pulse**: 80 - 100
- **Sputum**: +
- **T.B.**: +
- **Assessment**: W

**Work Capacity**

### PROGRESS

- **Decline**: Continual oscillations of T.P.
- **Frequent Haemoptysis**

### II. SPIROMETRY

<table>
<thead>
<tr>
<th>Class</th>
<th>Chest Circum. Stem length Surf. Area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>24.0&quot; 23 3/8&quot; 22 5/8&quot; 21 3/4&quot; 21</td>
</tr>
</tbody>
</table>

**Date**

- Vital Capac.
  - 1700, 1650, 1720, 1750, 1800, 1830, 1860, 1900.

- % of normal - 38.2:
  - Change during treatment: -5.9

**Weight**


**Percentage Change** - 4.6
Sex F Age 38 Occup. House wife Admitted 14.8.24

Complaint Cough, Sputum, Dyspnoea, Night Sweat.

History 1915 Rheumatic Right Lung; 1921 "Influenza" Recurrence of "Influenza" twice since

I. CLINICAL CONDITION

(a) At Commencement

Date 21.8.24
Temp. Range 94.8°F 101°
Pulse 80-100
Sputum \\
T.B. +
Assessment 1 to S

(b) At termination

Date 16.1.25
Temp. Range 98.2°F 101.4°
Pulse 80-105'
Sputum 30
T.B. +
Assessment S

Work Capacity

PROGRESS - Continuous Oscillations of Temp. Pulse

II. SPIROMETRY

Chest Circum. Stem length Surf. Area

<table>
<thead>
<tr>
<th>Date</th>
<th>Vital Capac</th>
<th>% of normal</th>
<th>% change during treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>1450, 1400, 1750, 1800, 1730, 1500, 1650, 1450.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Weight 7 ft, 7.5, 7.0, 6.5, 5, 4.7, 4.0, 3.4, 2.7, 2.0, 1.3, 0.6.  

Percentage Change ± 0
CASE (102)

Sex M Age 19 Occup. Electrician Admitted 20.11.24

Complaint Cough, Sputum, Streaking

History 6 years ago "Influenza" with Bronchitis. Cough 6 weeks ago exacerbation of symptoms

I. CLINICAL CONDITION

(a) At Commencement

Date 20.11.24
Temp. Range 93.4-98.6
Pulse 80-90
Sputum +
T.B. +
Assessment L1.8

(b) At termination

Date 13.1.25
Temp. Range Afebrile
Pulse 70-80
Sputum +
T.B. +
Assessment II. B.

Work Capacity III. B.

PROGRESS - Good after first fortnight. No further, Stevens. Gradual uneventful improvement

II SPIROMETRY

Chest Circum. Stem length / Computed Norm.

<table>
<thead>
<tr>
<th>Date</th>
<th>24.11</th>
<th>5.12</th>
<th>5.12</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vital Capac</td>
<td>-350</td>
<td>350</td>
<td>3710</td>
<td>3750</td>
</tr>
</tbody>
</table>

% of normal = -21.1 ; % change during treatment = +11.9

<table>
<thead>
<tr>
<th>Date</th>
<th>24.11</th>
<th>4.12</th>
<th>12.12</th>
<th>12.12</th>
<th>1.12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>10.9</td>
<td>10.11</td>
<td>10.12</td>
<td>10.13</td>
<td>11.2</td>
</tr>
</tbody>
</table>

Percentage Change +0.3
Sex M  Age 57  Occup. Foreman  Admitted 10.4.24
Complaint Cough, Sputum, Pain in left Chest
History Symptoms began insidiously a year ago.

I. CLINICAL CONDITION

(a) At Commencement

Date 18.8.24
Temp. Range 94.8°-98°
Pulse 90-90
Sputum ++
T.B. neg.
Assessment 4.25

(b) At termination

Date 9.10.24
Temp-Range afebrile
Pulse 75-85
Sputum ++
T.B. neg.
Assessment I
Work Capacity IIIa

II SPIROMETRY.

Chest Circum. Stem length Comp. Normal
Class A

\[
\begin{array}{l}
\text{Date} \quad 15.6, 19, 22, 26, 31, 0, 10 \\
\text{Vital Capac.} \quad 3800, 3400, 3240, 3200 \\
\% \text{ of normal} \quad -22.4; \% \text{ change during treatment} \quad -4.4 \\
\text{Date} \quad 25, 21, 19, 17, 15, 13, 10, 8 \\
\text{Weight} \quad 10.8, 10.11, 10.41, 10.9, 9.7, 9.1, 10.3 \\
\% \text{ change} \quad +6.7
\end{array}
\]

(Re-limited 22.12.25 - See Text)
CASE (104)

Sex M Age 34 Occup. Sailor Admitted 6.11.24

Complaint Cough and Sputum

History 6 years ago: "Influenza"; Cough set really began 6 months ago

I. CLINICAL CONDITION

(a) At Commencement

Date 6.11.24
Temp. Range 94.6 - 99°
Pulse 80 - 90'
Sputum ±
T.B. +
Assessment L2.8

(b) At termination

Date 10.1.28
Temp. Range Afebrile
Pulse 70 - 80'
Sputum ±
T.B. +
Assessment M I
Work Capacity III C

II. SPIROMETRY

Chest Circum. Stem length

Class A

\[
\begin{align*}
\text{Date} & \quad \frac{1}{11} \quad \frac{14}{11} \quad \frac{15}{12} \quad \frac{16}{11} \\
\text{Vital Capac} & \quad 5040, 3150, 3360, 3620 \\
\% \text{ of normal} & \quad -21.9 \% \text{ change during treatment.} = +12.5 \\
\text{Date} & \quad \frac{1}{11} \quad \frac{12}{11} \quad \frac{15}{12} \quad \frac{15}{11} \\
\text{Weight} & \quad 102.7, 102.7, 97.0, 97.2, 97.3, 97.3, 97.3, 97.3
\end{align*}
\]

Percentage Change +2.3
CASE (105)

Sex: F  Age: 11  Occup.: School  Admitted: 18.10.24

Complaint: Debility, loss of weight

History: Always a weakly child. Tub. glands since 1920

I. CLINICAL CONDITION

(a) At Commencement

Date: 18.10.24
Temp. Range: 98°-99.2°
Pulse: 80-90
Sputum: nil
T.B.: -
Assessment: Observation + Pulm Tub & Tub. adenitis.

(b) At termination

Date: 16.1.25
Temp. Range: 94.6-98.8
Pulse: 80-90
Sputum: nil
T.B.: -
Assessment: I

Work Capacity:  

PROGRESS - many oscillations of Temp. & Pulse. Ex. 100 to 106 and 52 to 62

II. SPIROMETRY. Chest Circum. Stem length Surf. Area

Class: C

\[
\text{Date} \quad \text{Vital Capac} \quad 14.25, 13.30, 13.20, 13.00, 12.40. 
\]

\[
\text{Weight} \quad 14.5, 14.7, 14.8, 14.9, 14.5, 14.6. 
\]

\[
\frac{\text{Vital Capac}}{14.25, 13.30, 13.20, 13.00, 12.40.} \quad 12.50, 13.00, 12.30, 13.00, 12.40. 
\]

\[
\frac{\% \text{ of normal}}{-29.4 \%} \quad \% \text{ change during treatment} 
\]

\[
\frac{\text{Weight}}{14.5, 14.7, 14.8, 14.9, 14.5, 14.6.} \quad 14.5, 14.7, 14.8, 14.9, 14.5, 14.6. 
\]

Percentage Change: ± 7.6
Sex M  Age 37  Occup.  labourer  Admitted 5/12/24
Complaint  Cough, Sputum, Pain in chest, streaking
History  Cough + Sputum have persisted for many years

I. CLINICAL CONDITION
(a) At Commencement
   Date  5/12/24
   Temp. Range 97.6-99.0
   Pulse  80-100
   Sputum  +
   T.B.  +
   Assessment  II

(b) At termination
   Date  19/1.25
   Temp Range afibrile
   Pulse  70-85
   Sputum  +
   T.B.  +
   Assessment  III
   Work Capacity  III/A

PROGRESS
Temp & Pulse stable after first week no further streaking in Sputum.

II SPIROMETRY.  Chest Circum. Stem length 32".  Computed Norm. 38.34".
   Class 2 12 19/12
   Date  2050 2200 2210
   Vital Capacit.  2210 2200 2210
   % of normal  -16.5 ; % change during treatment. +11.4
   Date  12/1 15/2 2/1 15/1
   Weight  6.9, 6.11, 6.1, 6.3

Percentage Change = +11.4
CASE (107)

Sex F Age 16 Occup. Shop Assistant Admitted 20.9.24

Complaint Cough, Sputum, Anorexia, Amenorrhoea.

History 7 years old Bronchitis - with several recurrent attacks since

I. CLINICAL CONDITION

(a) At Commencement

Date 20.9.24
Temp. Range 94.6-99.2
Pulse 80-90
Sputum 3+-
T.B. Reg.
Assessment 2.18

(b) At termination

Date 16.1.25
Temp. Range Afebrile
Pulse 70-80
Sputum 3+-
T.B. Reg.
Assessment 1

Work Capacity - gradual after first fortnight

PROGRESS

II SPIROMETRY.

Chest Circum. Stem length Surf. Area

<table>
<thead>
<tr>
<th>% of normal</th>
<th>change during treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>-17.5 %</td>
<td>+10.6 %</td>
</tr>
</tbody>
</table>

Percentage Change = +40.2