MEDICAL ASPECTS OF PHYSICAL EXERCISE

by

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The conception of physical exercise as a factor in health dates back to Hippocrates. In a translation[1] of the books of Paulus Aegineta with a commentary embracing a complete view of the knowledge possessed by the Greeks, Romans and Arabians on all subjects connected with medicine and surgery, Hippocrates is quoted as teaching that exercise renders the organs of the body hardy and fit for their functional actions. It makes the absorption of food stronger and expedites its assimilation, and it improves nutrition by increasing heat. It also clears the pores of the skin, and evacuates superfluities by the strong movement of the lungs. Although the remarks of Hippocrates on the effects of exercise are exceedingly pertinent and comprehensive, Galen is the great authority on this subject, which he treats very fully and philosophically in his "Hygiene". The particular effects that the ancients considered a few specific forms of exercise to have upon certain pathological conditions, are of interest. Thus Oribasius, Pliny and Aetius agree as to the good effects of equitation upon the stomach, while Hippocrates states that it is hurtful in diseases of the hip joint. All agree that riding on horseback is hurtful in diseases of the chest. Galen eulogizes hunting as being an excellent exercise to the body, and says that by the mental excitement which it produces many have been cured of dangerous diseases. Rhases mentions that during the prevalence of a certain pestilential epidemic, huntsmen were the only class of people who escaped its contageon. Oribasius states that swimming in the sea is particularly applicable in cases of dropsy, eruptive diseases of the skin and elephantiasis, although it is apt to prove injurious to the head and to the nerves, when too long continued. He also states that jumping and dancing occasion a determination downwards and hence

1. Aegineta, Paulus. Sydenham Society. Vol. 1. London 1844.

may prove useful in cases of amenorrhea, and in a case related in a work attributed to Hippocrates jumping was resorted to in order to produce abortion.

This brief summary indicates at least that the ancients considered physical exercise to have a medical aspect, and only a few of the outstanding men who made notable contributions along this line from the earliest times down to the present, will be mentioned. Such a list necessarily includes authorities like Ling, Brandt, Kellgren and Cyriax. Ling, who lived in the late eighteenth and early nineteenth centuries, and who included medical gymnastics as one phase of his famous "Swedish System of Gymnastics", wrote[2] of the treatment of such conditions as epilepsy, convulsions, headache, hemoptysis, hematuria, hepatic, renal and bladder troubles, and diseases of bones, muscles and joints. Brandt, who lived in the middle of the nineteenth century, was the inventor of medico-gymnastic treatment as applied to diseases of women. Other notable contributions to the subject as a whole have been made by Wide, Kellgren and Cyriax. The use of mechanical means for the application of exercise in therapeutics was first systematized and employed in a complete way by Dr. Gustav Zander of Stockholm, about 1859. He there established and directed the first Zander institute, and was actively engaged in the practice of medico-mechanical gymnastics until his death in 1921. He devised nearly one hundred machines to give his exercises and manipulations, and his system of mechanotherapy has enjoyed a wide popularity in Europe and has a considerable following in America, although it has been my observation that in the hospitals and corrective departments in this country where it has been installed it is falling into disuse, and that simpler exercises are more widely used. There are three series of machines, the first set in motion by

2. Cyriax, E. F. Concerning the Early Literature on Ling's Medical Gymnastics. Janus 3: 18-225-232. October, 1926.

the muscular power of the patient, the second by means of some motor and the third exercising by the weight of the patient's body, a corrective pressure or tension. A comprehensive summary of all the apparatus is given by R. Tait McKenzie[3] in "Exercise and Education in Medicine".

Ravenal[4], in his very comprehensive survey entitled "A Half Century of Public Health", mentions that from time immemorial "old people" have been asked the secret of their lives, which has enabled them to live so long. The folly of the question is seen in the variety of answers given. One of the well known answers was that of Horace, the Latin poet, who said, "Moderation in all things". Only naturally, physical exercise has come in for its share of the credit, and there have been quite a number of articles in the literature of the last ten years, where the evidence offered is entirely subjective and without any scientific basis. Only a few will be referred to, as they are of course worthless from the point of view of proving any real influence of exercise on longevity, and yet, in their conviction and frequency, they are interesting. The testimony of Sir Herman Weber[5], appearing in the British Medical Journal in 1918, and corroborated by Coughlin[6] in the Medical Record in 1919, is typical of this type of article. The benefits accruing from an exercise like walking, steadily carried out, include the following:

(1). An increased afflux of blood to the muscles.

(2). Increased nutrition combined with improved metabolism and production of body heat.

3. McKenzie, R. Tait. Exercise in Education and Medicine. 3rd ed. 360-363. W. B. Saunders Co. 1924.
4. Ravenal, M. P. A Half Century of Public Health. American Public Health Association. New York 1921.
5. Weber, H. Influence of Muscular Exercise on Longevity. British Medical Journal. 1:228. Feb. 23, 1918.
6. Coughlin, R. E. Physical Exercise in Later Life. Medical Record. 95: 558. April 5, 1919.

(3). Increased exchange of fluid between blood and tissue.

(4). Facility of removal of waste.

(5). Preservation of elasticity of thorax and lungs.

(6). Abundant supply of oxygen for blood and metabolism.

(7). Maintenance of healthy condition of organs of circulation from heart to capillaries and lymphatics.

(8). Massage of bones, keeping up the healthy condition of the bone substance, and through this the formation of a sufficiency of blood efficient for the fight with bacteria.

(9). Increased resistance of body against disease.

(10). Stimulation of brain centers which initiate the action of the different sets of muscles.

J. M. Taylor[7], Professor of Applied Therapeutics in the Temple University Medical Department, in a paper entitled "Is it Worth While for a Man of Fifty to Get into Physical Condition?" makes the following observations: "Potential energy, be it never so abundant, must be transmuted into kinetic,--the possible into the actual. For a man of fifty this is even more urgent than for the young man, since indolence, apathy or evil habit then dulls the edge of motor enthusiasm and saps initiative. Hence diffuse cripplings become only too common, often leading to degeneration and decrepitude. The state of unfitness for effort which prevails among the fully mature is really pathetic and wholly unwarrantable. It is a culpable, almost a criminal wastefulness of good energy. One point must be conceded by those who condemn or would ignore the desirableness of physical fitness in maturity, viz., that it is possible

7. Taylor, J. M. Is it Worth While for a Man of Fifty to Get into Physical Condition? Boston Medical and Surgical Journal. 179: 324. Sept. 5, 1918.

to learn the truth and judge only by personal experience. Unless one has enjoyed the thrilling pleasure of a body in full tone, in harmonious poise and discipline for whatever task duty offers,--that splendor of coordinated power, endurance and capacity, he cannot speak with authority. It is possible to neglect with some safety bodily activities until full maturity. There comes a time, however, when it is no longer safe to trust wholly to natural adaptations and compensations to supply health indefinitely without cooperation. A few only may be so fortunate. Long ago, Emerson, in formulating rules for achieving health, laid down the axiom that it must always be earned, not merely deserved. It is wholly fallacious to expect the powers of nature to carry the burden indefinitely without supplying personal cooperation". He concludes by saying that logical deductions tend to prove that physical fitness, natural or acquired, gives enormous advantages to the possessor. Statistics are not available upon which to base scientific deductions, hence dependence must rest upon statements of men, who, like him, endeavor to judge honestly of the facts by experience and critical observation, subjecting themselves to the tests. This last article certainly makes fewer sweeping claims than the preceding ones quoted, and recognizes that the conclusions are based largely on personal conviction. The writer makes some critical observations, which, in the absence of statistical records, seem worthy of consideration in the whole problem of the preservation of health.

The whole problem of the role of physical exercise in preventive medicine came to the fore during the World War, and periodicals such as the Military Surgeon and the Nation's Health were flooded with the observations of medical and non-medical writers upon this subject. Perhaps a fair indication of the trend at this time may be illustrated by a few excerpts. V. T.

Scott[8], Captain Medical Corps, Flight Surgeon, U. S. Army, writes as follows: "It has been my experience that the men in good condition take daily physical exercise on their own initiative, while men in poor condition lack the energy to take part unless ordered or urged to do so. A good physical condition contributes to mental alertness, good health and good morale, while a poor physical condition is conducive to morbid thoughts, petty ailments and a low morale". He graded the men into four classes as follows:

(1). Poor condition: Easily exhausted by mental and physical exertion; irritable; dull eyes--usually constipated with headache; sometimes nervousness and insomnia.

(2). Fair condition: Medium of (1) and (3).

(3). Good condition: Good physical bearing; elastic step; bright eyes; healthy complexion; not easily fatigued.

(4). Hard condition: Built up by a rigid system of training; physically fit for competitive athletics, but over trained for ordinary routine of life.

Using the Schneider grading, which is based on pulse rates, he found that one hour a day of compulsory mass athletics will change a group of men rated physically as 60% fair and 20% poor to 80% good and very good in one month, and concludes that such exercise will keep the men in a higher state of physical efficiency, increase the morale, and lessen complaints for petty ailments; and "that[9] whether a man be a bookkeeper or an aviator, physical fitness will be found to be a factor both in a man's general efficiency and in the degree of health he enjoys".

8. Scott, V. T. Daily Physical Exercise a Factor in Preventive Medicine. Military Surgeon. 50:648-651. June, 1922.
9. Scott, V. T. Physical Exercise in Preventive Medicine. Nation's Health. 4: 514-575. September, 1922.

Selekman[10] says that "recreation is the positive phase of the health program". At the onset of its participation in the World War, the United States government adopted one of the largest recreational programs in the history of the world -- not out of sentiment, but because it wanted to have the healthiest and most efficient army and navy possible. One of the outstanding movements which has committed its resources upon the conviction that "recreation is a healthbuilder and retainer" has been that launched against venereal disease. The United States Public Health Service, the American Association for Social Hygiene and all other agencies which have initiated programs to prevent the spread of venereal disease, have, without exception, strongly urged the adoption of well rounded recreational programs as one of the leading preventive measures. A recent issue of the Social Hygiene Legislative Manual holds that "clean, wholesome spare-time activities for both young and old are no longer considered luxuries, but necessities". Not only is recreation essential to the prevention of venereal diseases, but it is equally essential for the prevention of juvenile delinquency, which is fundamentally a disease. Specialists in this field have ever advocated adequate playgrounds and recreational facilities as a means of decreasing juvenile deliquency. Experts on child psychology infer that the commission of crimes by juveniles is due either to mental defectiveness or to biological defects (as the growth of certain glands) or to the perverted expression of normal instincts, chief of which is the play instinct. In business, too, recreation has been long since recognized as a valuable aid in maintaining health, morale and the personal efficiency of workers. It is significant that the establishments which have developed the best methods of management include a recreation

10. Selekman, B. M. Recreation - Its Place in Positive Health. Nation's Health. 4: 449-452. August, 1922.

program as part of their technique of organization. And these play activities, far from being actuated by pure sentiment, are operated for financial profit as well as for public service. They have found that the healthy and contented employee is the most productive employee, and they know that a recreation program is important in maintaining personal efficiency.

As regards the relationship of physical activity to the health and development of adolescent girls, Dr. Chisholm[11] in England, has recently summarized the situation. She quotes McKenzie as having stated that an additional inch in the height and five pounds to the weight have resulted from the indulgence in games and open air exercises in the last forty years. The encouragement given to gymnastics and games in girl's clubs, and by means of welfare work in industrial life has caused a considerable improvement in the general appearance of the young working woman in many areas. The question which is still causing anxiety to school medical authorities and to private practitioners is the effect of games on the menstrual period. Careful inquiries have been made in America by Dr. Celia Mosher and Dr. Augenette Parry and in England by Dr. Sanderson Clow and the writer. As a result there is now a definite recognition that among adolescent girls menstrual disturbances are of much less prevalence than was previously considered the case. There is also definite recognition that exercises and games in moderation do not cause any ill effects. Dr. Clow produced figures showing the lessening of inconvenience at the menstrual period since she encouraged the Chatterham girls to play games rather than refrain at that time. Cases of freedom from pain increased from 73% to 85%, and the cases of girls suffering from severe pain diminished from 2.5% to 0.5%. The writer collected 500 cases at Manchester High School, 40%

11. Chisholm, C. Physical Training of Adolescent Girls. Journal of State Medicine. 33: 37-42. January, 1925.

at a training college and 150 at another where gymnastics and games are a prominent part of teaching. Freedom from pain increased from 58.6% to 66.7% in Manchester High School. In Bolton where games are an especial feature, 94% have freedom from definite pain. In all these schools and colleges the normal routine of games and exercise is carried on whether the girls are having their period or not. The girls are allowed to sit out freely, however, if they do not feel well enough to play, but as a rule they take part and the consequences are apparently good.

The opinion of Hetherington[12], who was for some years State Supervisor of Physical Education in California, and is at present director of the Graduate School of Physical Education in New York University, in regard to the relationship of physical education and health, is of interest. He considers that physical education makes a direct contribution to health, in that it develops organic power, vitality and vigor. This alone does not guarantee health, however, as there are a score of other factors which have an influence. Yet he considers it to be the only source of organic power this side of heredity. All the other factors are favorable or unfavorable to the proper functioning of the organism, that is, to growth or health. Activity, however, is the only source of the development of the latent powers planted in the organism by heredity.

Turning now from the preventive aspect of medicine, let us consider the definite pathological conditions in which some form or other of physical exercise has been applied. The classification given by R. Tait McKenzie[13] of the various types of physical exercises and their broader lines of application will perhaps map out the field, and then certain of the pathological conditions

12. Hetherington, C. W. Special Objectives in Physical Education with Relationship to Public Health. American Journal of Public Health. 11: 520. June, 1921.
13. McKenzie, R. T. Exercise in Education and Medicine. W. B. Saunders, Philadelphia. 3rd ed. 1923.

and a discussion of the particular activities best suited to each will be taken up in more detail.

TYPES OF EXERCISES

1. Of Strength

These exercises require maximum contraction and great concentration of attention, and are, therefore, of especial value for weakened or undeveloped muscle groups.

VALUES:

1. In strengthening weakened and inactive muscles of abdomen, which are permitting distension of lower zone and possibly herniae.
2. To develop the muscles of the chest, back, abdomen and legs in the large group of deformities which result from yielding of structures of support at foot, hips, back and neck. Im paralysis these simple concentrated movements of carefully selected groups are the chief hope for an even partial recovery of lost power.
3. In the general development of parts put into disuse by surgical necessity, much can be done by these exercises to shorten the post-operative convalescence.

11. Of Skill

VALUES:

1. In the re-education of coordinations that must be learned for the first time, or have been impaired or lost by disease.

a. Largely in posture - which has never been learned or has been lost in school or factory.

b. In tabes dorsalis - for the ataxic gait.

111. Of Endurance

This group includes such activities as walking, climbing, riding golf, etc., and are indicated chiefly for their general tonic effect and influence on respiration, circulation and excretion.

They should be begun gradually and the amount increased as the system accommodates itself.

VALUES especially in such pathological conditions as

1. GOUT: This is usually a disease of overnutrition and underelimination and the indications would be to decrease the intake and increase the output of waste by all avenues.
2. DIABETES: Muscular action favors combustion of sugar. The exercise here should be gentle in character, systematic and discontinued well within the limits of fatigue.

1V. PASSIVE MOVEMENTS, INCLUDING MASSAGE AND MANIPULATION

The effects are nutritive on the muscle substance through stimulation of the local circulation.

VALUES - in infantile paralysis and in sprained or disabled joints.

1. To stretch contracted scars.
2. To increase the range of movement in stiffened joints.
3. To rehearse the movements of joints whose muscles are paralysed or weakened, and thus detect or prevent contractures.
4. To break down slight adhesions - if well prepared with heat.
5. To quicken the mending of fractures, the splint being removed, the part is gently massaged and a slowly increasing dose of movement administered, the splint then being replaced.

"There is no defense for the almost criminal custom of some surgeons who keep a sprained joint fixed for weeks in a stiff plaster dressing, lowering its circulation and allowing the formation of adhesions that may cripple its action for months, when the patient should be on his feet again in a week or two".

6. In the treatment of arthritis deformans.

"Schools of osteopaths and chiropractors have flourished on the neglect and ignorance of the regular profession. A perscription should be written in detail, giving the nature, strength and number of movements, and each movement should be carefully supervised. A slight difference in position may bring in muscles which should be at rest and vice versa".

It would be futile, in this paper, to attempt to cover the specific forms of exercise suitable to each of the conditions mentioned above. The use of properly selected and properly supervised exercise in the treatment of such conditions as flexible flatfoot, functional kyphosis, lordosis and scoliosis, and anterior poliomyelitis (after the acute stage), is, I believe, recognized throughout the medical profession, without question, at present. In some of the other fields, however, there is more difference of opinion and the value of exercise has not been so definitely established. These conditions will be discussed in more detail.

In the treatment of abdominal weakness and herniae, especially in the case of inguinal herniae which comprise about 95% of all herniae, according to McKenzie[14], exercise is an important factor. Inguinal hernia is permitted by a stretching and spreading apart of muscle and tendon, and exercise may be of marked assistance in strengthening and closing the internal and external abdominal rings, to guard against its advent or prevent its return. Perhaps one of the most potent factors is a standing posture in which the abdomen is protruded and the chest sunken, forcing down the abdominal contents on the relaxed lower zone, and in McKenzie's experience repeated and violent effort

14. McKenzie, R. T. Exercise in Education and Medicine. W. B. Saunders, Philadelphia, Pa. 478 ff. 3rd ed., 1923.

seems less fruitful of cases than the dull and steady pressure on the relaxed abdominal walls. Muscular atony may of course follow severe illnesses, especially where there is great loss of fat, but there is also the atony that accompanies sedentary habits and begins to show up in those approaching middle life, especially affecting the unused abdominal muscles. Such authors as McKenzie submit a carefully worked out scheme of exercises applicable in the above conditions. To quote one other writer on a closely related phase of this subject, mention might be made of the report of Hurst[15], in the Guy's Hospital Report of 1925, on the subject of massage and remedial exercise in the treatment of visceroptosis and constipation. Hurst points out again the well known fact that the viscera are normally kept in position by the slight intra-abdominal pressure which is maintained by the postural tone of the muscles of the abdominal wall and the pelvic floor. In this writer's estimation the efficiency of the circulation depends upon the maintainence of an adequate intra-abdominal pressure and consequently deficient tone of the abdominal and pelvic muscles leads to an impaired circulation and many of the symptoms commonly ascribed to the associated visceroptosis are really due to this. He also states that it is important to realize that the constipation which is very frequently associated with visceroptosis is not due to intestinal kinks, but is a result of dyschezia, both the inefficient defecation, and the visceroptosis being direct results of the weak abdominal muscles. And again to quote from the article by Goldthwait[16] upon "The Relation of Posture to Human Efficiency and the Influence of Poise upon the Support and Function of

15. Hurst, A. F. Massage and Remedial Exercises in Medicine: Abdominal and Pelvic Muscles and their Treatment by Massage and Remedial Exercises. Guy's Hospital Report. 75: 328-341. July, 1925.
16. Goldthwait, J. E. The Relation of Posture to Human Efficiency and the Influence of Poise upon the Support and Function of the Viscera. American Journal of Orthopedic Surgery. 7: 371. February, 1910.

the Viscera", this physician says, "In the various abdominal visceral ptoses, there is more to do than to treat locally by drugs a stomach which may have sagged out of place, or even to suture a kidney in place because it too may have sagged. Operations, stomach washing, and the various forms of local treatment for all such conditions are undoubtedly necessary and may give temporary relief, but none of these can be expected to really cure the lesion until the whole body can be used in such a way that there is the least possible tendency to visceral displacement and there is the greatest amount of energy available for the proper nutrition and function of all the structures of the body. Until the body is considered first and the local condition second this large class of abdominal disturbances will be unsatisfactorily treated, either by the internist or the surgeon, and the medical profession will be reproached for that for which, judging from many of the results obtained in such cases, reproach seems deserved". Although it does not seem advisable to quote in detail, it is interesting to note that in the recent German[17] literature exercises for the abdominal muscles are mentioned as being desirable in cases of intestinal ptosis, and also in cases of chronic constipation for "self massage" of the intestines.

As regards the role of exercise in the treatment of respiratory diseases, the reports from the Cook County Tuberculosis Hospital are the most interesting of any I have found in the recent literature. The following is quoted from the report of Bay[18]. "It has been found by long experience that patients with acute manifestations of tuberculosis are much improved by rest

17. Von Quincke, H. Bewegungsübungen bei Nachbehandlung innerer Krankheiten. Münchener Medizinische Wochenschrift. 66: 1339. November, 1919.
18. Bay, H. H. Graduated Exercise as Inaugurated at Cook County Tuberculosis Hospital. Illinois Medical Journal. 29: 285. April, 1916.

in bed; that having attained a normal temperature, and other evidences of improvement, they may, if prematurely allowed to get up and move about, quickly relapse with a return of the acute symptoms. The phenomenon has lead to the principle of "controlled auto-inoculation" or a system of graduated exercise, using the patient's own organism for the elaboration of protective substances for the neutralization of the infection from which he is suffering. With the subsidence of fever and other manifestations of activity, graduated exercise is commenced. It remained for Dr. Paterson of Frimley, England, to offer a satisfactory explanation of the real value of exercise. He found there was a definite relationship existing between auto-inoculation induced by exercise and the condition of the patients as shown by the opsonic index, body temperature, weight, and the character and quantity of the sputum. All the advantages formerly recognized as the result of exercise could be explained on the theory of active immunization, effected by the introduction of slowly increasing doses of toxin, derived from the forms of infection and elaborated in the patient's own body. This type of treatment requires constant supervision, and the patient must know the danger signals of an "overdose" -- such as failing appetite, malaise, or loss of weight. These indicate a reduction of exercise or a return to rest. The policy in this institution is to have the work consist of something constructive, as well as recreation in the form of games. A physician working with them is found to be a great incentive. With the increased appetite and weight, due to the increased vigor of our patients, we have a striking picture of contentment and satisfaction throughout the exercise classes. This is particularly noticeable among the young women, who as tuberculosis patients, are notoriously poor eaters. It requires an appetite to enjoy food, and with the time occupied in useful work, they eat their meals with a relish which is marvelous, when compared with patients in

other departments or in the same department before this system was placed in vogue. Graduated exercise limits the destructive process and hastens the fibrosis. It supplants the use of tuberculin and the dose of auto-tuberculin is far easier controlled. It is also far more potent in being elaborated from bacilli which are from the strain with which the patient is afflicted. This form of treatment avoids the criticism of the modern treatment of pulmonary tuberculosis that it "pauperizes the patient", but instead, under proper medical supervision, it returns him to a working efficiency".

A second reference of interest is that of Hunt[19], published in Guy's Hospital Report of October, 1925. He considers that the treatment by massage and remedial exercise in diseases of the lung and pleura comes under two headings:

1. LOCAL

   a. To empty the bronchi or cavities in the lung. It is particularly useful here in cases of chronic bronchitis, bronchiectasis, or phthisis with cavity formation. The traditional treatment of bronchitis has been rubbing the chest with camphorated oil. This writer believes it doubtful whether the oil itself has any effect, but feels that there is no question that massage of the chest in the various forms excites coughing, and so promotes the evacuation of secretion. He points out also the advantage of having the patient so lie that gravity aids the passage of mucus to the trachea.

   b. To promote expansion of collapsed or compressed lung.

   In this case the patient is made to breathe as deeply as possible, with a view of getting air into the collapsed alveoli. He is placed

19. Hunt, G. H. Massage and Remedial Exercise in Diseases of Lung and Pleura. Guy's Hospital Report. 75: 447-461. October, 1925.

in such an attitude that expansion of the healthy lung is limited and that of the diseased lung free. This treatment is applicable to a large number of conditions, among them cases where the lung has been compressed by pleural effusion and where small portions are collapsed as a result of obstruction to the smaller bronchi, as in bronchitis.

The following conditions must be considered:

1. DISEASES OF THE PLEURA

There is no scope for massage or exercise in the acute stage of dry pleurisy and in fact the pain will be aggravated and the inflammatory process probably made more active. With an effusion, however, much can be done. It differs under the following conditions:

a. CLEAR EFFUSION. A vast majority of these, if not secondary to cardiac or renal disease, are due to tuberculosis. Here, this writer considers that the greatest care must be exercised, and that remedial exercise and treatment must be postponed until the temperature and pulse rate are normal.

b. EMPYEMA. After drainage is established, exercise should be started as soon as possible. It must be started before fibrosis has already taken place in the underlying lung. This author has been immensely impressed with the result of exercise here. He considers that scoliosis ought never to be allowed to occur as a complication of empyema, for it can always be prevented by exercises if these are not started too late. With an uncomplicated empyema it is possible to start breathing exercises within twenty-four hours after operation. This can be pushed to the point of

breathlessness for the greater the dyspnoea the greater the lung expansion.

2. FIBROSIS OF THE LUNG

Where replacement of the lung tissue is only partial, some improvement in expansion will often result.

3. UNRESOLVED PNEUMONIA

In this condition massage has been used, but it is difficult to say how far it loosens the secretion in the alveoli. Of greater value, here, is treatment directed toward expanding the diseased lung.

4. DISEASES OF THE BRONCHI

Here the reflex stimulation of the chest by various types of chest massage is most useful.

11. GENERAL TREATMENT

In all diseases of the lungs or pleura, particularly of the former, the patient suffers from some degree of breathlessness on exertion, and graduated exercises play an important part in improving the exercise tolerance. Where the heart is free from disease and the blood vessels healthy, exercises should be given which produce a slight degree of dyspnoea. The hardest exercise should raise the pulse to about 130 in young people and 100 to 110 in older subjects.

Again, quoting from recent German literature as regards convalescents from pleurisy, Von Quincke[20] says that the patient should lie in bed on the healthy side with the arm at the side and the legs drawn up, the head on a pillow, and the arm on the affected side thrown over the head. This hand

20. Von Quincke, H. Bewegungsübungen bei Nachbehandlung innerer Krankheiten. Münchener Medizinische Wochenschrift. 66: 1339. November, 1919.

finds a hold in a sling arranged on the upper bedpost. The patient then breathes deeply for five minutes, and this is repeated three times daily. In this way the affected side of the chest is especially exercised. The exercises further the absorption of fluid exudations by stimulating the lymph and blood stream in the wall of the thorax; they prevent the formation of adhesions and, where they exist, further their removal. If continued pain or fever follows the exercises, they are discontinued or made milder, exactly as in a subsiding inflammation of the joints. This writer considers that the indications and necessity for such exercises, after pleurisy, exist in the same manner as for exercises after inflammation of the joints. He is special advisor for internal diseases at the Frankfurt Reserve Hospital and sees how little, there, such treatment is known or used in practice. He quotes Gangele (Münchener Medizinische Wochenschrift, 16: 442, 1919) as describing cases of lateral spinal curvature in girls of six to nine years after pleurisy of four to six weeks duration. This writer emphasizes that a retraction could not here have resulted from adhesions, but rather the one-sided retardation of breathing, which attended the pleural discharge, persisted only out of habit, in the same way that a bad writing posture leads to habitual scoliosis. He believes that timely breathing exercises would have prevented the scoliosis.

Let us next briefly consider the role of exercise in the testing and treatment of diseases of the circulation. Sir James MacKenzie has always considered that the ability to do muscular work is the most reliable test we have of a heart's soundness, and R. Tait McKenzie[21] points out that the experiences in the late war have gone far to confirm this opinion. He states, in

21. McKenzie, R. Tait. Exercise in Education and Medicine. W. B. Saunders, Phildelphia, Pa. 515 ff. 3rd ed., 1923.

fact, that exercise proved to be the only sound clinical test of the heart's ability to perform its work. Wilson[22], working on the problem of the exercise tolerance of children with heart disease, finds that in children with chronic heart disease the exercise tolerance tests give important information utilizable for a scientific basis for the intelligent regulation of activities. These results, based on a careful study of seventy children having definite organic heart disease, without symptoms of insufficiency, seem to indicate that the fear of exercise is largely unwarranted, and that a wider latitude may be permitted with safety. Again, the work recently reported from Guy's Hospital seems the most interesting of any found in the current literature on this subject. Hunt[23], in reporting this work in 1925, says that muscular work may do good or harm in heart disease, and is, therefore, a means of treatment which must be used with considerable discretion. There are always two questions which must be answered.

1. At what stage should active movement be started?
2. What amount of muscular work should be given and how quickly should it be increased?

The answers will depend upon the nature of the case, and it is convenient to consider them in the three following types of circulatory disorder.

a. Acute carditis, or the condition in which the heart is the seat of a recent infection, as rheumatic fever. Here, excessive muscular work may cause a recrudescence of the infection and this, rather than a general dropsy from cardiac failure, is the danger in young people.

22. Wilson, M. G. Exercise Tolerance of Children with Heart Disease. Journal of the American Medical Association. 76: 1629, June, 1921.
23. Hunt, G. H. Massage and Remedial Exercises in Diseases of the Circulation. Guy's Hospital Report. 75: 20-34. January, 1925.

b. Chronic cardiac insufficiency, or the condition in which the heart is structurally damaged by some degenerative process, or some inflammatory process which took place months or years before. In this class there is clear evidence that progressive muscular work increases a patient's capacity for exertion. This writer feels that further experience is necessary before the best rate of progress is known, but feels that the system described in his article, which cannot be given here in detail, produces a definite increase in the exercise tolerance.

c. Effort syndrome, or a condition in which the patient is suffering from a functional circulatory disturbance without organic disease of the heart or blood vessels. It is still disputed whether hard muscular work ever causes any serious damage here, but it is certain that its effects are never so disastrous as they may be in the other two cases.

Each of the above is, of course, a study in itself, which cannot be entered into here. Hunt considers that the amount and how quickly it may be increased must be judged by the effect of exercise on the heart and that the most convenient measure of this is afforded by the pulse rate. He concludes that treatment by progressive muscular work is of the greatest value in the circulation and rests on sound physiological principles. If, however, it is to take the high place it deserves as a therapeutic measure, it must be purged of theories and practice that will not stand the test of clinical and scientific investigation.

Pope[24], in a recent article in clinical medicine, states that it is poor practice to order a cardiac patient to bed. The heart is a muscular organ; it should be trained, muscularly, to do as much work as it reasonably can, so

24. Pope, Curran. Physical Treatment of Cardiac Diseases. Clinical Medicine. 33: 12. 858-860. December, 1926.

long as this does not tax the musculature. A cardiac case should exercise; rest; exercise; rest again. For years in one of the London hospitals, Sir Andrew Clark's "Staircase Treatment" of heart disease has been used. Pope has used it for the past twenty-five years, and feels convinced that we can gradually develop the cardiac musculature by exercise, just as we would that of the arm.

Another possible role of exercise in relationship to circulatory conditions is that pointed out by Von Quincke in the German article previously referred to, in which he states that he maintains that for healthy individuals from forty years of age on exercise acts as a prophylaxis against arteriosclerosis.

Elsom[25], in the "Archives of Physical Therapy" for 1926 makes a similar statement as to the value of exercise in the warding off of arteriosclerosis, based on the fact that function helps to maintain and preserve structures in a healthful condition. It seems probable that the value of exercise in this connection is largely a matter of conjecture, and that there is no well established proof of its usefulness.

Just a word might be said as to the place of exercise in the treatment of locomotor ataxia. The exercise treatment, here, is based on the education of the impaired central nervous system, and the re-establishment of the enfeebled coördinations and sensibility. It consists in relearning the habitual movements disorganized by disease. Reliance must be placed mainly on exercises of skill, alternating with passive movements and massage as a relief to improve the nourishment of the muscles without continuing the demand on the rapidly tiring will power.

Another of the interesting uses of exercise recently advocated by

25. Elsom, J. C. Therapeutic Exercise: A Neglected Method in Physiotherapy. Archives of Physiotherapy. 7:2. p. 65-73. February, 1926.

certain surgeons is that of active motion in the treatment of fractures. Yates[26] and Stevens in a recant article in the Annals of Surgery draw the following conclusions:

1. Bone repair occurs more promptly and advantageously if active motions are employed. Evidence has been presented to prove that cooperation with the natural reparative processes leads to an earlier healing and more complete functional recoveries than are obtainable by the orthodox procedures when immobilization is enforced.
2. Treatment of fractures so as to cooperate with nature's methods of healing is the one way to obtain better results.
3. Active motion is a constant factor in recovery and no recovery is complete until unrestricted active motion is possible.
4. The earlier active motion is instituted, the more prompt and complete are recoveries, provided a development of deformities is prevented during the healing process.
5. Methods of treating fractures should be designed to interfere the least with general activities and to permit the earliest resumption of active motion by the structures involved in the injury.

Darrach[27], Dean of Surgery at Columbia University, in an article in the Illinois Medical Journal, 1926, expresses similar opinions, which space forbids quoting in any detail.

In conclusion, as to the uses of exercise in specific disorders, mention might be made of its role in obesity. As Elsom[28] points out, there are

26. Yates, J. L. and Stevens, G. W. Active Motion in the Treatment of Fractures. Annals of Surgery. 82: 617-634. 1925.
27. Darrach, William. Massage and Movements in the Treatment of Fractures. Illinois Medical Journal. 49: 199-202. 1926.
28. Elsom, J. C. Therapeutic Exercise: A Neglected Method in Physiotherapy. Archives of Physiotherapy. 7: 2. p.65-73. February, 1926.

several factors in excessive fat, namely, underoxidation, overnutrition and certain endocrine dysfunctions. Fat is first deposited over inactive muscles, like those of the abdomen, hips and neck. Suitable and regular exercise, combined with properly regulated dietary control, tends to consume this unnecessary fat. Often,however, the amount of exercise must be considerable and pushed to the point of general sweating.

Having covered, at least in a broad way, some of the medical aspects of physical exercise as reported in the more recent literature, it seemed that the next step in the problem was, logically, to try to make some personal observations or to carry out some experimental work. At first it seemed possible that by attempting to elicit meticulously careful exercise histories from the patients examined in the hospital, that some conclusions as to the relationship of exercise and health might be deduced. After a short period of experimentation along this line, however, it seemed somewhat futile, as there were so many variants in the problem that the establishment of any causal relationship of exercise to present health seemed impossible. It would seem that the only scientifically sound method of attacking the problem from this angle would be to have a picked group of individuals, as in a factory, where the age, sex, working conditions, diet and amusements were as nearly the same for the whole group as possible. Then, by dividing this group into two parts, and over a considerable period of time giving one group exercise and restricting the exercise of the other, it might be possible to draw some fairly accurate conclusions as to the effect of exercise on general health as measured, perhaps, by weight, appetite, strength, efficiency, frequency of upper respiratory infections, etc. Obviously such an experiment was impossible under the present conditions.

Another possible phase of the subject which offered opportunity for experimental work was the effect of exercise on convalescence. The post-operative aspect of the problem was brought to mind for two reasons. First, because an Associate Professor of Physiology in the University of Wisconsin, whose chief work in recent years has been along the line of the physiology of exercise, recently underwent a major abdominal operation, and, following it, very early began to take exercise, increasing the amount as much as his strength warranted. Both he and his surgeon, who is a Professor of Surgery in the University of Wisconsin Medical School, were greatly impressed by his excellent convalescence and by his unusual ability to take up his routine work, when he first left the hospital. Both of these doctors were anxious that experimental work be carried out along this line. The second reason was that during the past two years the writer has seen one case of death from pulmonary embolism, following an otherwise successful cholecystectomy in a young man of twenty-eight years, and also several cases of femoral phlebitis, and it has always seemed that these postoperative accidents might conceivably be avoided with early and persistent massage and exercise, as the element of stagnation is generally conceded to be the factor of prime importance. It is possible, in fact, as regards this feature, that it may be controlled by posture alone. Meyer[29], reporting in the American Journal of Surgery in August, 1926, says that the occurrence of this complication is not considered to be under the surgeon's control. The thrombus usually occurs in the left femoral vein, perhaps in 99% of the cases, owing to anatomical reasons. The great danger, of course, is of possible pulmonary embolism, just when the patient is on the highway of recov-

29. Meyer, W. On Posture During and Immediately After Operation with Reference to General Anasthesia. American Journal of Surgery. New Series 1: 2. 63-67. August, 1926.

ery. He thinks that the thrombus can be prevented, and in a comparatively simple way. For more than twenty-five years he has practiced posture during the after treatment, until the patient is out of bed. The patient is put in a slight Trendelenberg posture. The blood is thus made to descend and inasmuch as it is by gravity running downhill toward Poupart's ligament, it will from there rush up, one might say, to about the level of the renal vein, from where the sucking action of the right heart will assist in making it enter the right auricle. Of course care is taken that the upper part of the body is sufficiently elevated in order to avoid annoyance to the patient. Since this method has been employed, the author has seen no more thrombosis of the left femoral vein. This article is quoted in some detail to show the evidence for mechanical etiology in thrombosis and although adequate results may conceivably be otained from posture alone, certainly massage and exercise should be an additional safeguard, and also accomplish other benefits which will be pointed out later. One other recent investigation which is of interest in this connection is reported by Lister[30] in the Lancet of January, 1927. In studying the causation of pulmonary embolism following operation he came to the conclusion that there was no indication that sepsis exerted any influence in causing massive embolism. There was a marked increase in the incidence of embolism among two groups: older age groups and those who had an incision through the anterior abdominal wall, whatever the ultimate object of the operation. Since diaphragmatic respiration plays a great part in maintaining circulation in the large abdominal veins, it is suggested that the inhibition of diaphragmatic respiration accounts for the comparatively high incidence of embolism following

30. Lister, W. A. A Statistical Investigation into the Causation of Pulmonary Embolism Following Operation. Lancet 1: 3. January 15, 1927.

abdominal operations. It seems reasonable, then, to assume that early and persistent deep breathing might largely overcome this factor of inhibited abdominal circulation.

In covering the American literature on the use of exercise in convalescence very little could be found up to the time that this work was begun in September, 1926. In connection with the treatment of convalescents in the various army hospitals during and after the World War, there were numerous articles which discussed the role of exercise, but in all of these the exercise was not instituted until the patients were able to leave the wards, and was often of a vocational nature. The following is an example of a number of others. Powell[31], athletic director of the Sixth Naval District, writing in the Modern Hospital in May,1919, noted the fact that the best treatment for convalescent patients has been a matter of discussion for many years. At one time it was thought that absolute rest was the quickest and only effective method of restoring normal health. On the other hand, some have maintained that a partial rest with frequent mild, graduated movements designed to strengthen the weakened parts and obviously suited to the general condition of the patient would effect a more rapid recovery. He claims that his experience confirms the latter view. In this hospital, exercises were given to the patients as soon as they were able to leave the wards, the kind and amount being prescribed in each individual case. There was no detailed account of the exercises given, and the estimate of results was evidently based on observation rather than on any absolute tests.

Dr. Charles H. Mayo[32], in a chapter on the "after-care of surgical

31. Powell, W. D. Physical Exercise in the Care and Treatment of Convalescent Patients. Modern Hospital. 12: 324. May, 1919.
32. Mayo, C. H. Collected Papers of the Mayo Clinic. 7: 864. W. B. Saunders Co. Philadelphia, Pa. 1916.

patients" in the Collected Papers of the Mayo Clinic, makes the following statement: "When patients are compelled to remain in bed for a long time, they should be turned and moved as much as possible. They should be urged to keep their limbs moving as much as their position and condition permit, which aids markedly in inhibiting muscular weakness occasioned by long rest. Getting patients out of bed as soon as possible after operation conserves strength, improves the mental attitude, prevents the lowering of blood pressure and the change in the heart muscle, and apparently has reduced the percentage of sudden deaths from embolism. The sooner patients can be removed from the depressing influence of general hospital life, the more rapid their convalescence".

Some months after this work was begun, however, several articles appeared in the American periodicals which had a direct bearing on this problem. The following is quoted from the February issue of the Battle Creek Michigan, Hospital Bulletin[33]. "The idea of exercise for surgical patients will at first thought appear quite impractical and inappropriate. Nothing very vigorous is implied, however -- nothing more complex than such simple bed exercises as deep breathing and flexing of the fingers and toes. These begin on the second day. Even the first day the patient is encouraged to take a few deep breaths every hour to combat pulmonary stasis and to encourage splanchnic circulation. From day to day the exercises are increased, so as finally to include arm and leg flexing, arm raising, leg raising, turning in bed, and a considerable variety of other movements, according to the individual case. The purpose of these exercises is to combat the ill effects of confinement in bed, the weakening of the heart, loss of vascular tone, weakness of muscles, increase of intestinal stasis, and general loss of bodily muscular power and control,

33. Case, J. J. Physiotherapy in the Postoperative Management of Surgical Cases. Battle Creek, Michigan, Hospital Bulletin. 27: 46-51. February, 1927.

which inevitably result from a long illness in bed. Of course, there are certain incidents, such as elevation of temperature, pain on movement, and other special conditions, which may contra-indicate exercise of any sort and demand complete rest, but most surgical cases, even abdominal cases, are greatly benefited by exercise of the muscles, judiciously administered, and especially by deep breathing exercises. The benefits are shown by an early sense of strength and security, which enables the patient to rise from his bed in less than the usual time and to find himself steady on his feet, on rising, even after long confinement. Massage is a useful means of muscular exercise, but it is a passive work, and therefore less valuable to the patient than the active, purposive movements above referred to.

Sante[34], in an article in the Journal of the American Medical Association for May, 1927, dealing with the treatment of massive collapse of the lung, states that in this condition the treatment is simple and consists in rolling the patient back and forth on the uninvolved side. This simple procedure has, in all instances in which used, proved successful in promptly re-establishing aeration of the lung. This, he adds, suggests the possible prophylactic value in postoperative treatment of changing the position of the patient from one side to the other every few hours during the first few days following operation.

The role of exercise in postpartem care is pointed out by Polak[35] in the April number of the American Journal of Obstetrics and Gynecology. He emphasizes that during pregnancy the enlarging uterus gradually distends the ab-

34. Sante, L. R. Massive (atelectatic) Collapse of the Lung, with especial Reference to the Treatment. Journal of the American Medical Association. 88: 20-15-39-42. May 14, 1927.
35. Polak, J. O. The Details of Postpartem Care. American Journal of Obstetrics and Gynecology. 13: 4-432-446. April, 1927.

domen and separates the recti muscles. When at the close of labor the uterus is suddenly emptied of its contents, the intra-abdominal pressure is lowered and the intestines and bladder lose their muscular tone and are therefore subject to distension. It was formerly the practice to control this distension by employing a tight abdominal under the false impression that this artificial support would remedy the muscular weakness. He states that we now know, however, that the muscular tone of the abdominal muscles may be restored by suitable active exercises which the woman can do several times a day while lying in bed, and so replace the muscular support which nature intended the abdomen to have. As a rule these exercises may be begun after the first forty-eight hours of the puerperium. He cautions that as long as the red lochia persists one cannot be sure the sinuses are completely closed and hence the possible danger of embolus, so that exercises should be postponed or discontinued until any bloody discharge ceases.

In the recent German literature, two articles of particular interest were found. The article by Von Quincke[36], previously referred to in the discussion of the role of exercise in specific pathological conditions, might be briefly referred to again. He suggests a rather unique contrivance for stimulating the circulation of lower extremities in bedridden patients. The hips and knees are bent to nearly right angles and the ankles, in their entire length, are laid in a towel sling which is suspended from a scaffold placed crossways over the bed. With this arrangement the patient can carry on a kind of walking movement in the air with very slight muscular exertion. These exercises are adapted to patients confined to bed for a long time, and especially, too, are of value in the prevention of thrombi. Of the total number of patients

36. Von Quincke, H. Bewegungsübungen bei Nachbehandlung innerer Krankheiten. Münchener Medizinische Wochenschrift. 66: 1339. November, 1919.

in a ward for the treatment of internal diseases only a few require the localized exercises previously referred to, but in the opinion of this writer all convalescents require the more general exercises, preferably in the nature of so-called "free exercises" which affect all parts of the body and are a necessary complement for the restoration of normal movement and of normal blood distribution and circulation. Of course, the amount of exercise must be adapted to the strength and the type of the foregoing disease. Von Quincke considers that this type of exercise is best undertaken by a number of patients together, preferably in a gymnasium under trained direction. In the medical clinic at Kiel he had such a room arranged. In this work, however, there must also be individualization, the emphasizing of certain exercises and the omission of others with certain patients. This must be controlled by the attending physician. A great deal depends on the personality of the teacher, and he must understand how to handle the patients. The teacher must learn to consider individual needs and at the same time preserve the group idea as that has something which spurs one on. He believes that a nurse may be trained to handle this work for the women.

Smitt[37], in the same periodical in March, 1920, writes in reply in Von Quincke's article, and commends the latter's attitude in relation to the importance of exercise in the after treatment of internal diseases, a mode of treatment only little in vogue at the time. He says that for many years he has upheld the same demand for he knows from experience that although as yet relatively little notice is taken of it, he has had enough opportunity to learn to know the benefits of exercises which have been begun early enough with the convalescent. The treatment with exercise, he considers, should not follow

37. Smitt, W. Value of Gymnastic Exercise for Convalescents. Münchener Medizinische Wochenschrift. 67: 292. March 5, 1920.

only when the patients have left the hospital, for in this way the best time for a quick and complete recovery of the patients is easily lost. It should, most certainly, be begun during the sojourn in the hospital, indeed while the patients are still in bed. The results can be easily seen by anyone when such patients first get up, when compared with those not exercised. And while in the case of patients not exercised at the proper time, there is often a question of a further sojourn in some sanitorium to regain strength after their dismissal from the hospital or clinic. In the case of patients given timely exercise this is usually not necessary, or at any event, less frequently. Von Quincke recommends simple free exercises and exercises with simple apparatus, and, further, the installation of a teacher of gymnastics in the hospitals and clinics, which would surely pay. The oft heard opinion that the patient is still too weak for gymnastics and must first gain some strength before movements can be begun, cannot be allowed to stand by the physician to whom this kind of treatment is known. On the contrary, the strengthening is attained more quickly by means of timely gymnastics. Naturally the physician ordering them must be as well posted concerning their manner of application as concerning the other prescriptions to be applied by him. If that is the case, then he has at his command an exercise-therapy which can be adapted to the strength of the patient. With the weakest patients he begins only with a few passive movements, whether on the limbs, trunk or head. In a few days with the increase in strength he adds other passive movements, and gradually active and resistive movements. At first everything is given in bed, and later out of bed. The learning of manual gymnastics (as against those involving apparatus) insofar as the convalescent is concerned is comparatively simple, and for the person administering them requires so little exertion that they might be demanded of every nurse. During the war Smitt worked as a specialist-physician

adviser for the mechanical treatment of the sick and wounded in the hospital of Saxony. At this time he was able to familiarize over five hundred nurses and one hundred physicians with manual gymnastics for patients, and the good results which he achieved with them, although the education could be only a limited one on account of conditions, caused the Saxon Minister of the Interior to make a ruling in 1917, according to which every nurse who wished to take the state examination for nurses in Saxony, had, in the future, to be instructed and examined in manual gymnastics and massage. Concerning Von Quincke's recommendation of the installation of a teacher of gymnastics in the hospitals, Smitt is heartily in accord. Such arrangements had been made at that time in the State Hospital in Dresden - Johannstadt, in the Carolahaus, also in Dresden. The Saxon Ministry of the Interior has further declared itself for the spread of manual gymnastics, and has erected a state institute in Dresden for therapeutic gymnastics and massage, which serves as an instructional institution for physicians and nurses, and also as a clinic for invalids without means. The author considers this a great advance, but, on the other hand, if the use of therapeutic gymnastics becomes general, which he advocates, then instruction in it must be included in the instructional plan for those studying medicine, for as long as the physicians themselves are not conversant with the manual method of treatment, they will have no special interest in its application by their subordinates. He concludes by saying that if he recommends manual gymnastics so warmly, he does so with good right, for he was able, without special difficulty, to have it carried out in thirty-seven hospitals in Saxony during the war, under the direction of physicians and nurses whom he had first to educate, and who had not known the method of treatment until then. How great their activity was is evident from the fact that in one division in Dresden alone, during the four years of the war about 12,000 wounded and sick

were so treated, and over one million treatments were carried out.

From the French periodicals, one report of particular interest along this line was found. This was a report by Boigey[38], who is "le médecin principal à l'Hôpital militaire de Bordeaux". He refers to the fact that in caring for convalescents the doctor makes a series of prescriptions which have for their aim, of course, the aiding of their recovery of health. Among them is one which is of constant usage, namely, obligatory rest, which is considered necessary by the state of weakness of the convalescents. This manner of conducting the procedure is not always justified by the facts. If one takes care to weigh the convalescents regularly, to measure by the aid of a dynamometer the increase of their strength, to evaluate the degree of precision of their neuro-muscular reactions, and, especially to consider the behavior of their respiratory exchange, one establishes undeniably that those who have been sedentary throughout the duration of their convalescence recover more slowly than those who have taken moderate exercise, proportional to their strength and to their physiological possibilities. During five years, the writer has been able to collect data upon this problem of practical hygiene, important enough at this time to be usefully reported. This he discusses under four main headings:

1. The beneficial influence of exercise upon the recovery of weight, during convalescence.

Sixty-two men, from twenty to thirty-two years of age, convalescing from different fevers including measles, scarlet, mumps, diphtheria, acute quinzy, acute bronchitis and grippe have been observed from the point of view of the evolution of their weight during the days which followed the time at which

38. Boigey, M. le Dr. M. Uses of Exercise in Recuperation of Convalescents. Bulletin l'Académie de Médicine. Paris. 92: 1461. December 16, 1924.

they were authorized to leave their beds. Thirty-seven of these have taken no regular exercise. They were limited to taking each day a short walk in a very slow manner, either in the hospital itself or in the yard, if the weather was good. Their average weight, at the time they first got up from their beds, was 55 kilos 850, and a month later they weighed an average of 57 kilos 150. In this interval of time the average increase of the individual of this group was, then, 1 kilo 3,000 grams. The other twenty-five individuals coming from the same group of convalescents were asked, during their convalescence, to take at first short walks; and later exercises and various plays in the open air. These were of short duration, four to ten minutes, but repeated many times each day. In this latter group the average weight passed, in a month, from 55 kilos 600 to 58 kilos 200, or a monthly increase of 2 kilos, 600 grams. Moderate exercise, then, with a convalescent, favors the recovery of normal body weight.

2. The influence of exercise upon the recovery of the muscular strength of convalescents.

Twenty-eight subjects, aged from twenty to twenty-nine years, who took no exercise during their convalescence, have had the following increase in their muscular strength:

Average strength of flexors of right forearm	when out of bed 29 kilos 400	after one month of convalescence 34 kilos 600
Average strength of extensor muscles of trunk	86 kilos 700	97 kilos 200

Nineteen others, who, daily, devoted themselves to different forms of exercise, including gardening, games in the open air and walk, had the following increase:

As above	28 kilos 900	37 kilos 900
As above	86 kilos 150	121 kilos 200

The figures show that the recovery of strength is much more rapid in the group practicing moderate exercise.

3. The influence of exercise upon the behavior of the pulmonary ventilation and respiratory exchange.

Fifty-one convalescents from twenty to twenty-four years of age, examined from this point of view, yielded the following results:

Twenty-three of them, kept almost entirely at rest, during a month had an average pulmonary ventilation of 4 litres 8 a minute, in repose, and comsumed an average of 0 litres 240 of oxygen, a minute, at rest.

Twenty-eight other patients who submitted regularly to the simplest forms of movement throughout the duration of their convalescence had an average pulmonary ventilation of 7 litres 30, per minute, at rest, and consumed an average of 0 litres 344 of oxygen, a minute, in repose.

This shows that the tissues and the blood of convalescents subjected to light exercise, each day, are more oxygenated than those of patients of the same category maintained in sedentary habits. Under the influence of exercise all of the functions are activated and this general functional activity favors the recovery of health.

4. The influence of exercise upon the neuromuscular reactions of convalescents.

Examination of the muscular sense by testing the sense of position and the knowledge of resistance, practiced in series with a large number of convalescents, has shown that the patients recover an exactitude of motor appreciation more quickly the more that they have regularly practiced during their convalescence, exercise and games in the open air.

Boigey draws the conclusions that in order to hasten the recovery of convalescents it is important not to leave them in muscular inactivity, in

which condition the irrigation of the organism by the blood is insufficient. Further, the convalescent reduced to a sedentary life, breathes superficially. The volume of air, and consequently of oxygen, introduced into the lungs with each respiration is deficient, with a resultant sluggishness of the circulation. Under these conditions the recovery of the functions in their integrity is retarded, and the forced inactivity creates a state of nutrition unfavorable to recovery. While all the convalescents suffered from absence of exercise, this was more marked the younger the patient. The exercises recommended by the author are always very moderate, very short and frequently repeated during the day. He feels that free spaces ought to be arranged within easy access of every hospital and that convalescents ought to practice there a cure by exercise under medical prescription and surveillance. This appears more and more to be an indispensable complement to treatment -- greatly shortening the duration of convalescence and favoring the return to full health.

To turn now directly to the experiment performed, it was decided that only abdominal operative cases would be used, at least in the beginning. These have included appendectomies with either the McBurney or right rectus incision, cholecystectomies, herniotomies (unilateral or bilateral inguinal or ventral) and gastroenterostomies. It was thought advisable to start with massage, progressing as soon as possible to passive movements, then to active movements and finally, when feasible, to active movements against resistance. The progression varied, of course, with each patient, and may be studied in the individual cases on the accompanying charts. The massage included the usual effleurage, petrissage and tapotement. The complete group of exercises used will be discussed briefly and then the usual progressions taken up in more detail. The exercises included:

1. Flexion and extension of the fingers.

2. Flexion and extension of the forearm.
3. Abduction and adduction of the arm (to horizontal level).
4. Hyperadduction and flexion of the arm (crossing the body).
5. Flexion and extension of the toes.
6. Flexion and extension of the knee and hip (sole of foot in contact with bed)
7. Hip flexed position knee flexing and extending (flexed hip supported by patient's hands).
8. Bicycling.

At first head twisting was also used, but many of the patients objected to it, saying it made them dizzy, so it was discontinued. Deep breathing was also used with each exercise period. The progression consisted in breathing progressively deeper, holding the breath for longer periods, and a greater number of repetitions. This latter method was also used in the case of all the movements, in addition to the progression from passive to resistive. The series were always started with ten repetitions and progressed to twenty. We found that each treatment required a minimum of thirty minutes to each patient. In the earlier series of six patients we attempted to give three such treatments daily, but later because of difficulty in schedule, we found it necessary to give only two daily. I am under the impression that more frequent periods of possibly shorter duration would be preferable, if feasible. Dr. Schmidt, the surgeon who performed the operation on the majority of the patients on whom we worked, said that we might make pain our criterion in judging how much exercise to give, so far as the incision was concerned. In other words anything which the patient was willing to do could not hurt him, and he agreed to take all responsibility for the stitches holding if the patient wished to do a hand-stand! I wish to acknowledge at this time, the assistance of Miss Mary White, a senior in the

Physical Education Department in the University, who carried out about one-half of the practical work reported in this paper.

The usual procedure was as follows: The patient was interviewed before the operation whenever possible and friendly relations were established. We felt that it was a great help when we went into the room for the first time after the operation if the patient was somewhat acquainted with us, rather than going in as complete strangers and trying to make even a brief explanation of what we wanted to do, as of course the patients were often extremely ill at this time. During the preliminary interview we also inquired into the exercise history of the patient in considerable detail. We went through the entire program of exercises with the patient, taking the pulse rate before and after, in order to see his preoperative response to exercise. In some cases this was undoubtedly practically his normal response, when the case was one without any acute symptoms or recent illness, but in other cases, where the individuals had been ill or on a restricted diet for some time previously, this response would probably not be the normal one. We always emphasized to them that all the exercises they were doing at this time were not to be done again for some time, and that after the operation there would be only massage and a gradual addition of movement as they wished it, and assured them that they would never be asked to do anything which was painful or which they did not care to do. Without this explanation, I think they might react very unfavorably to our first entry, when in very ill condition they had a mental image of having to carry out vigorous movements.

As a rule, the patients were operated upon during the morning and we first saw them during the afternoon. At this time we gave massage for five minutes to each of the upper extremities and for eight minutes to each of the lower extremities, a total of twenty-six minutes. It was practically

always possible to get a good superficial reaction in this length of time. We massaged especially over the saphenous and femoral veins in the lower extremities. In addition the patient took deep respirations, usually ten unless there was some particular contra-indication in the way of pain, which condition was rare. In addition, the patients did as much in the way of passive or active movements of the extremities as they wished or seemed able to do without discomfort. This varied from the extremes of only passive movements of the fingers and wrist, ten times on each side, in patients who were extremely nauseated, to the opposite extreme of a blacksmith, who was operated upon for a postoperative ventral hernia which had never given him any actual symptoms and who did all the movements of the upper extremities either actively or against resistence (by request), and with the lower extremities carried out active flexion and extension of toes and of ankles, inversion and eversion of ankles and flexion and extension of hip and knee (keeping the sole of the foot in contact with bed), each ten times on each side. Probably the majority progress about as far as all the passive movements of the upper extremities except the flexion and hyperadduction of the arm (crossing the body), which is often objected to and usually not attempted at the first treatment.

In the first series of six cases, a second treatment was given either in the late afternoon or early evening of the same day. At this time massage was repeated as before and usually a few additional movements executed. With later cases, largely because it was impossible for us to give this amount of time, the second treatment was abandoned. At the present time I am under the impression that perhaps the latter is the more desirable arrangement in any case;two afternoon visits seem to give quite a short rest interval when the patient is acutely ill, and if the second visit is postponed until early evening, the patient has often just received his hypodermic of morphine and it is

desirable to leave him undisturbed.

It is probably unnecessary to go into all the details of the subsequent daily progression of treatments, as it was necessary to vary it in each case depending on such factors as the natural strength of the patient and his previous exercise habits, the seriousness of his operation (as for example a simple appendectomy with a McBurney incision as against a bilateral herniotomy), his reaction to the operation (that is, the presence or absence of gas pains, or urine retention, etc.), and the patients own degree of willingness to cooperate. A detailed record of this progression is given in the tables. Massage was used in inverse proportion to the amount of exercise which could be taken, and was used in no case later than the fourth postoperative day, and rarely so long as that.

It was felt to be advisable to keep the exercises as simple as possible for two reasons. First, because later in convalescence it was often convenient to have the patients carry out the exercises alone, for often they had just gotten up into the wheel-chair as we arrived, or had guests, or for some reason found it inconvenient to take the exercise at the only time we were able to be there. The simpler the exercises from this point of view, the better. In the second place, we believe that if this work proves to be successful enough to warrant its adoption on any considerable scale, that the exercises should be simple enough to be carried out by a nurse, under a doctor's supervision. Although I believe this arrangement would be far from ideal, it may conceivably prove to be better than nothing at all, in institutions where trained workers were unavailable. In this case, certainly, the exercises should be of as simple a nature as possible. The only possible argument for a diversity and complexity of movements, so far as I can see, would be the interest element, and this has been absolutely no problem with us, as the patients were always

absolutely interested in the simple movements which were, we felt, sufficiently distributed to mean a good all round use of the muscles of the extremities, sparing those of the trunk as much as possible.

We have made the following observations as a result of our work:

1. We feel that by taking a little sympathetic interest in each patient it is easy to establish a relationship of friendliness so that the patient is always glad to see us again, and that in work of this kind where coöperation is so indispensible that this is very important.

2. We also feel that it is helpful to talk over the situation with the patient either in the first interview or during the earlier treatments, as soon as he feels well enough to talk and seems interested, and to tell him what we consider the advantages of the massage and exercise to be, and the theories back of its use.

3. We are careful to start in on the upper extremities where there is no question of pain, then to progress to the left lower extremity if the incision is on the right as is usually the case, and finally to go to the right lower extremity last, after he has gradually become accustomed to the idea of movement, and has found what he can do without discomfort. In this way we get much more coöperation than if we started in on the lower extremity on the affected side.

4. It is important to watch the patient's face carefully for any evidence of pain. There are two chief reasons for this. In the first place, if one waits for the patient to demur before stopping a given exercise, a patient who is a very "good sport" may undergo considerable discomfort before he will ask to stop. Again, it is better to watch for a quick flash of pain or discomfort to cross the face than to keep asking the patient if this or that hurts him. This keeps reminding the suggestible patient that perhaps it should be

hurting, and perhaps makes him less willing to do the maximum that he could easily do with safety.

5. Finally, we feel that the massage and exercise should always be made as pleasurable as possible, because this undoubtedly gives an added stimulus and zest to any work. This means considerable understanding of character in order to make the appeal successfully in the range from the flapper to the farm laborer, but it is one of the essential problems of the doctor always, and the sooner it can be understood and at least partially mastered, the better the outlook for the young practitioner.

The objectives which we have had in mind in carrying out this work include the following points:

1. To shorten the period of convalescence after surgical operations. By decreasing every postoperative convalescence by one day, the country might conceivably be saved millions of dollars annually.

2. To make the transition back to routine daily life more gradual, and to put the patient back in better condition to take up his occupation where he left off.

3. To combat venous stagnation as a factor in thrombus formation.

4. To decrease any tendency toward postoperative pneumonia through deep breathing with the resultant increased aeration of the alveoli and the increased blood supply to the part.

5. To influence the psychic outlook by means of interested stimulation accompanying an activity in which the patient can see an improvement and a gain in strength from day to day.

6. To strengthen the muscles of the feet so that foot strain will be less apt to occur on resumption of activity.

7. To stimulate regenerative processes by increased blood supply to the part undergoing the healing process.

8. To increase the general metabolism of the patient, thereby increasing the appetite with a resultant general gain of strength and feeling of "well being".

As regards the drawing of any final conclusions from the twenty-five cases reported in this work, it seems desirable to let the individual case records speak for themselves, for the most part. We realize that our series is too small to warrant any very definite deductions, but we feel that the following points of summary can be made:

1. Exercise, of the kind and amount indicated in this paper, has had not the slightest harmful effect on any of the patients.

2. The massage and exercise has been enjoyed and looked forward to by the patients practically without exception. Space forbade a report of all the spontaneous remarks of approval and enjoyment, but such a record would be very interesting.

3. The surgeons under whom this work was done (at the Wisconsin General Hospital in Madison, Wisconsin and the St. Francis Hospital, La Crosse, Wisconsin) have been unanimous in their approval.

4. The interesting fact has been noted that an excessively fast pulse rate tended to become slower following the exercise, while a slow or moderately fast pulse (up to 90) tended to accelerate. This phenomenon has been noted in normal individuals by Dr. Percy Dawson of the Department of Physiology of the University of Wisconsin.

5. Five of the patients have written to us after returning home that they were still continuing their exercises daily and felt that they were gaining a great deal of benefit thereby. In no case did we suggest that the exercises be continued after leaving the hospital. This suggests an interesting field for the "carry over" of physical activities in future work along this line.

6. Since we have been able to demonstrate in a series of twenty-five patients that a program such as we outline has had absolutely no untoward effects on the patients; since the patients have, practically without exception, enjoyed and looked forward to the treatments; since the surgeons under whom we have worked have been unanimous in their approval of the experiment; and because of the theoretical reasons offered for the physiologic, psychic and economic benefits to be derived, we submit this program as outlined by us as one worthy at least of further investigation and very possibly of adoption as a part of the hospital regime.

K E Y

Repeated 10x on each side - 1
Repeated 15x on each side - 2
Repeated 20x on each side - 3

UPPER EXTREMITIES

Flexion and extension of fingers - A series
  Active movement vs. resistance - A
  Active movement - A'
  Passive movement - A"

Flexion and extension of forearm - B series
  As above
Abduction and adduction of arm - C series
Flexion and hyperadduction of arm - D series
  (straight arm crossing body)

LOWER EXTREMITIES

Flexion and extension of toes - 1 series
  Active movement vs. resistance - 1
  Active movement - 1'
  Passive movement - 1"

Inversion and eversion of ankle - 11 series
  As above

Flexion and extension of ankle - 111
Flexion and extension of hip and knee - 1V
  (Full range possible with foot in constant contact with bed)
  Active movement vs. resistance - 1V
  Active flexion and active extension - 1V'
  Passive flexion and active extension - 1V"

Supported flexed thigh position:
  flexion and extension of knee - V

Bicycling - V1

HEAD AND RESPIRATORY

Deep breathing - a
Head twisting - b

PATIENT	AGE	OCCUPATION	BRIEF HISTORY OF EXERCISE
(1) L. N.	49	Farmwife	Liked to play games as child. Since ten years of age, has often worked in summers in the fields; milked, etc. Often on feet from 5:00 A.M. to 8:00 P.M. with housework.
(2) H. S.	15	Farmer	Always helped with farm work. Stopped school fall of 1926 and worked eight hours a day since, plowing and other farm work. Plays baseball, foot-ball and rides horse-back.
(3) T. G.	38	Mechanic	Worked since fourteen years old. Fifteen years ago a blacksmith for four years. Since then, various types of mechanical work, always on feet. Played baseball and games before twenty years old (when lost left hand).
(4) F. H.	20	Freshman in University	In elementary and high school played foot-ball, baseball, hiked and swam. In University corrective gymnasium and basket-ball.
(5) C. M.	30	Nurse	In private elementary school organized sports and gymnastics. Later, school in Canada, always played hockey, tennis, skied and skated. Considers herself quite athletic, but not done much in last two years.
(6) M. P.	21	Sophomore in University. (Advanced sophomore)	Always played outdoors as child. Could swim almost as soon as could walk. Grade school--track and basket-ball. Two years of college--hockey and track. Past two years--no organized sports, but skating, hiking, etc.
(7) H. O.	38	Farmer	Always worked on farm. Average number of hours work daily is ten, although has worked sixteen hours daily in summer. No sports.

DATE OF ADMISSION	EXERCISE BEFORE OPERATION	DATE OPERATED	OPERATION
Dec. 1, 1926 (First on urological service)	Once-pulse 84 before and after	Dec. 14, 1926 9:10 A.M.	Cholecystectomy
Dec. 5, 1926 (Operation delayed because running slight temperature)	Six times. Pulse-on average 68 before and after	Dec. 14, 1926 8:00 A.M.	Bilateral inguinal repair (relaxed rings)
Dec. 14, 1926	Once-pulse 72 before and after	Dec. 16, 1926 10:00 A.M.	Repair of ventral post-operative hernia. (By midline incision without opening peritoneum)
Dec. 17, 1926	Once-pulse 92 before and 96 after	Dec. 18, 1926 10:30 A.M.	Left inguinal hernia and varicocele
Dec. 17, 1926	Once	Dec. 18, 1926 7:30 A.M.	Appendectomy (Right rectus incision and exploratory)
Jan. 7, 1927	None. Emergency operation	Jan. 7, 1927 6:30 P.M.	Appendectomy (McBurney incision)
Jan. 3, 1927 (Operation delayed because patient running slight temperature)	Once 78 - 78	Jan. 11, 1927 10:00 A.M.	Posterior gastroenterostomy (for duodenal ulcer)

PATIENT	AGE	OCCUPATION	BRIEF HISTORY OF EXERCISE
(8) R. W.	24	Senior student in University	In elementary school and high school played volley ball, basket-ball, hockey. Swimming. College-two years of physical education requirement-basket-ball and dancing. Past two years only hiking and little swimming.
(9) I. K.	16	High school student	Never considered herself athletic. At fourteen years of age had difficulty with weak arches, so she has not taken regular gymnasium work in high school. Swims and plays tennis.
(10) C. B.	36	Securities	As a boy played outdoor games as baseball, etc. Since adult years, has had no exercise except occasional golf.
(11) S. J.	15	School girl (Vocational High School)	Never considered herself athletic. Always tired easily and had "side ache". No physical education in elementery or high school. Roller skating only form of exercise.
(12) E. G.	21	Senior student in University	As a child played outdoors considerably, roller and ice skating. Basket-ball for three years in high school. In University took two years requirement in tennis, swimming and gymnastics. Has done very little in past year. Always got tired.
(13) H. P.	43	Housewife	Played outdoors as a child, but no exercise since except housework. No outdoor exercise at all in adult years.
(14) C. W.	34	Housewife (on farm)	Always liked outdoor play as child. Never played any organized games. On feet often as much as twelve hours daily, indoor and outdoor work.

DATE OF ADMISSION	EXERCISE BEFORE OPERATION	DATE OPERATED	OPERATION
Jan. 10, 1927	Once-84-80	Jan. 11, 1927 8:00 A.M.	Appendectomy (Right rectus incision. Many adhesions found. Retroflexed uterus was replaced)
Feb. 7, 1927	None	Feb. 8, 1927 8:00 A.M.	Appendectomy (Right rectus incision. Also incision of ovarian cyst and dilatation of cervix)
Feb. 11, 1927	None	Feb. 12, 1927 8:00 A.M.	Appendectomy (Right rectus incision)
Feb. 16, 1927	None	Feb. 17, 1927 10:00 A.M.	Appendectomy (Right rectus incision)
To infirmary Feb. 10, 1927 To hospital Feb. 16, 1927	None	Feb. 17, 1927	Cholecystectomy
April 1, 1927	None	April 5, 1927 10:15 A.M.	Cholecystectomy and appendectomy
April 5, 1927	None	April 8, 1927 9:15 A.M.	Cholecystectomy

PATIENT	AGE	OCCUPATION	BRIEF HISTORY OF EXERCISE
(15) R. S.	28	Bookkeeper	Never had physical education in elementary or high school. Took swimming one year in Milwaukee Downer, also season of tennis and bowling. Excused from physical education requirement in University of Wisconsin on doctor's recommendation (is sister-in-law of said doctor). Never considered herself athletic. No exercise in past few years.
(16) A. C.	21	Nurse (Wis. General Hospital)	Had no regular physical education work in elementary or high school. Played basket-ball in high school. Has always been active, skating, walking and swimming. Does not consider herself athletic.
(17) H. G.	23	Student (Junior in University)	Never athletically inclined. In elementary and high school did not play on teams or take any regular physical education. As a boy played some baseball and basket-ball, but not interested in it. At University excused from requirement because of weak arches.
(18) A. T.	19	Student (Sophomore in University)	Took systematic physical education work in New York City public schools from sixth grade to high school. In high school was earning her way and had no time for physical education. Same true in University. No regular form of exercise but swims at intervals and enjoys it. Does not consider herself athletic.
(19) G. S.	19	Student (Sophomore in University)	Never took physical education in school. Tennis, hiking and dancing only forms of exercise. Never active as a boy and rather small and weak.
(20) H. L.	23	Nurse	Took physical education in elementary and high school. Never did strenuous work. Not interested in any regular form of exercise. Never active as a girl. Does not consider herself athletic.

DATE OF ADMISSION	EXERCISE BEFORE OPERATION	DATE OPERATED	OPERATION
Feb. 28, 1927	None	Mar. 1, 1927 9:00 A.M.	Appendectomy (Right rectus incision).
Mar. 13, 1927	None	Mar. 17, 1927 7:30 A.M.	Appendectomy (Right rectus incision and puncture of right ovarian cyst)
Mar. 22, 1927	None (acute attack)	Mar. 22, 1927 8:00 P.M.	Appendectomy (Right rectus incision)
Mar. 22, 1927	None	Mar. 22, 1927 3:00 P.M.	Appendectomy (Right rectus incision. Uterus being retroflexed was placed in normal position, and cigarette drain inserted in pelvis)
April 1, 1927	None	April 2, 1927 6:00 A.M.	Appendectomy (McBurney incision)
April 8, 1927	None	April 9, 1927 8:30 A.M.	Appendectomy (McBurney incision)

PATIENT	AGE	OCCUPATION	BRIEF HISTORY OF EXERCISE
(21) M. B.	24	Student in University Working as engineer at night	Always exceedingly active. Member of wrestling team at University for two years. Played on University baseball team. Used to large amount of exercise and many types of sport.
(22) E. S.	22	Student (Graduate in University)	Always active in sports. Took physical education thruout elementary and high school and college. Swimming, hiking and skating all interest her and she considers herself quite athletic. Spends summers in outdoor life on northern lake.
(23) M. L.	14	Housework	Always been very active. Baseball, swimming and hiking are favorite sports. Had to stop school in 8th grade to help with work at home, mother an invalid. Up at 5L00 A.M. and does all housework on farm. Considers herself quite athletic.
(24) M. A.	23	Clerk in store until Jan., 1927 Housework	Some physical education in grades and high school. Never active except for walking a great deal. No regular form of exercise since high school. Not at all athletic.
(25) H. C.	25	Physician	Regular physical education requirement thruout school and college. Always played team games and tennis, swam, etc. as a boy. No regular form of exercise now. Good physical condition.

DATE OF ADMISSION	EXERCISE BEFORE OPERATION	DATE OPERATED	OPERATION
April 9, 1927	None (acute attack)	April 9, 1927 10:30 A.M.	Appendectomy (McBurney incision)
April 11, 1927	None (acute attack)	April 11, 1927 5:45 P.M.	Appendectomy (McBurney incision)
April 11, 1927	None	April 12, 1927 12:30 P.M.	Appendectomy (McBurney incision)
April 13, 1927	None	April 21, 1927 10:55 A.M.	Appendectomy (McBurney incision)
April 24, 1927	None	April 25, 1927 8:00 A.M.	Appendectomy (McBurney incision)

PATIENT	ESTIMATE OF COOPERATION	DAY OF OPERATION	1st DAY POST-OPERATIVE	2nd
(1) L. N.	Excellent	2:15 P.M. 5 min. massage each extremity. A"1-B"1-C"1 92-96 5:00 P.M. Massage as above A'1-B'1-C'1 1'1-11'1-111'1-1V"1. a5x 112-100	10:30 A.M. Massage-uppers 3 min. each; lowers 5 A'1-B'1-C'1 (last on left only, pain in right shoulder) 1'1-11'1-111'1-L.1V'1-R.1V"1 a5x (painful) 112-100 1:45 P.M. Uppers as above 1'1-11'1-111'1-1V'1-V'1 100-116 7:30 P.M. A1-B1-C1 Lowers as above Massage thighs 3 min. 116-112	9:10 A.M. (Still only rectal nourishment) A'1-B1-C1-D'1 1'1-11'1-111'1-1V'1-V'1.a10x. Massage thighs-3 min. 96-96 2:30 P.M. As above 100-102 4:30 P.M. As above except 1V"1 substituted and V'1 omitted 104-104
(2) H. S.	Good	2:00 P.M. 5 min. massage each upper extremity. 8 min. massage each lower extremity A"1-B"1-C"1-84 before-68 after 4:30 P.M. Massage as above A'1-B'1-C'1 1'1-11'1-111'1-1V'1. a10x 76-80	10:00 A.M. A'1-B'1-C'1-D'1-1'1-11'1-111'1-1V"1-b10x-a10x Massage 3 min. lowers 80-80 2:00 P.M. As above except a5x. 76-92 (In considerable pain) 7:30 P.M. A'1-B1-C1-D'1 1'1-11'1-111'1-1V"1-V"1. a10x Massage uppers and lowers each 3 min.	10:00 A.M. As immediately preceding except 1V'1 92-84 2:00 P.M. As above 68-84 4:30 P.M. As above except V'1 76-88

PATIENT	3rd	4th	5th	6th
(1) L. N.	11:00 A.M. A'2-B2-C2-D2 1'2-11'2-111'2 1V'2-V'2-V1'2 (with slight assistance). 3 min. thigh massage. a10x 100-108 2:00 P.M. As above 104-104 8:00 P.M. As above 108-112	9:00 A.M. As preceding 104-104 2:00 P.M. (Tired after visitors) Uppers as before-lowers 10x 100-108 5:00 P.M. As usual-all 15x 84-88 8:00 P.M. Did all but bicycle alone	10:30 A.M. A'3-B3-C3-D3 1'3-11'3-111'3 1V'3-V3-V1'3 a15x 88-96 3:00 P.M. As above 92-104 7:00 P.M. (Pain in right side) As above except bicycle omitted 96-96	10:30 A.M. As preceding including bicycle 76-92 3:30 P.M. As above. Seen by Dr. Dawson 72-72
(2) H. S.	10:00 A.M. A'2-B2-C2-D2 1'2-11'2-111'2- 1V'2-V'2-V1'2 (with slight assistance) a15x 64-72 2:00 P.M. As above 8:00 P.M. As above 72-88	10:30 A.M. As preceding 72-76 1:30 P.M. As preceding except V1'2 (alone) 80-76 4:40 P.M. As above 80-84	10:45 A.M. A'3-B3-C3-D3 1'3-11'3-111'3- 1V'3-V'3. R. V1"3. (Last omitted on left-painful) 76-76 4:30 P.M. (Note: Temperature 100^{20}F. Throat sore, more soreness in incision than previously. Dr. Schmidt advised that abdominal muscles rest for present). Uppers as above. Lowers omitted 84-80 7:30 P.M. Uppers as above 1'3-11'3-111'3 a10x. Massage thighs 5 min. each 84-84	11:00 A.M. Uppers as before 1'3-11'3-111'3. L.1V"3 (extension also passive) Massage lowers 8 min. 68-72 3:30 P.M. As above Seen by Dr. Dawson

PATIENT	ESTIMATE OF COOPERATION	DAY OF OPERATION	1st DAY POST-OPERATIVE	2nd
(3) T. G.	Excellent	2:00 P.M. A'1-B1-C1-D'1 1'1-11'1-111'1-1V'1 Massage 3 min. each extremity a10x 72-68 5:00 P.M. As above, also V1'1 (this was volunteered) Massage lowers 3 min. 68-68	10:45 A.M. As preceding a10x 88-88 2:00 P.M. (Complaining of gas pains). Uppers as above. 1'1-11'1-111'1-1V'1. 3 min. massage-lowers 92-88 7:15 P.M. (Severe gas pains, temperature 101 2o) Uppers as above Lowers-massage only 5 min. each 80-80	9:00 A.M. A'1-B1-C1-D1-1'1-11'1-111'1-1V'1-V'1-V1'1 a10x. 80-80 1:30 P.M. A'2-B2-C2-D2-1'2-11'2-111'2-1V'2-V'2-V1'2 a15x 80-80 4:30 P.M. As above 76-80
(4) F. H.	Excellent	2:45 P.M. Massage 3 min. uppers, 5 min. lowers. A"1-B"1-C"1-D"1 60-60 7:00 P.M. As above, also 1"1-11"1-111"1 80-68	10:15 A.M. A'1-B"1-C"1-D"1-1'1-11'1-111'1-1V"1 Massage as preceding. a10x 60-60 3:30 P.M. (Had just had severe gas pain and having light applied). Massage 5 min. uppers and 8 lowers A'1-B1-C1-D'1-1'1-11'1-111'1-1V"1 80-72 8:00 P.M. As above 80-72	10:30 A.M. Uppers as preceding 1'1-11'1-111'1-L1V"1 R.1V'1-R.V'1-R.V1'1 Massage lowers 5 min. 64-72 P.M. Uppers as above 1'1-11"1-111'-L. 1V"1-R.1V'1 92-92 P.M. As above 80-80

PATIENT	3rd	4th	5th	6th
(3) T. G.	11:15 A.M. A'3-B3-C3-D3 1'3-11'3-111'3- 1V'3-V3-V1'3 a10x 68-80 5:00 P.M. As above 50-68 7:30 P.M. As above 64-68	11:30 A.M. (Complained of soreness in incision). All as preceding except omitted 1V' 60-60 3:45 P.M. As above, also 1V'3 added "Hurts more when starts to move and then loosens up" 64-68	11:15 A.M. A'1-B1-C1-D1- 1'1-11'1-111'1- 1V'1-V1-V1'1 a10x 52-64 4:30 P.M. As above No pain-did all easily) 64-64	10:00 A.M. A'2-B2-C2-D2 1'2-11'2-111'2- 1V'2-V2-V1'2 (Could easily have done more) a10x 56-64 3:00 P.M. As above. (Did all very vigorously. Insisted on keeping right on when urged to rest) 58-72
(4) F. H.	10:30 A.M. A'2-B2-C2-D2 a10x-b10x-1'2- 11'2-111'2-R. 1V'2-R.V'2-R. V1'2-L.LV"2-L. V'2 (Felt very weak on left but did not hurt) 64-72 4:00 P.M. As above 76-76	10:00 A.M. Uppers as preceding 1'2-11'2-111'2- R.1V2-R.V'2-R. V1'2-L.LV'1-LV'1 LV1'1 80-84 3:00 P.M. As above 64-64 (Note: Asked if movement of left leg hurt incision-said,"I feel it, but it feels good".	Exercises carried out 3 times daily by patient himself (at least 15x each	As preceding

PATIENT	ESTIMATE OF COOPERATION	DAY OF OPERATION	1st DAY POST-OPERATIVE	2nd
(5) C. M.	Good	3:00 P.M. Massage of uppers 5 min. A"1-B"1-C"1 (Considerable nausae and vomiting. Objected to any move at time) 70-70	10:30 A.M. Massage as preceding. A'1-B'1-C'1-1'1-11'1-111'1-1V'1 92-84	10:30 A.M. A'1-B1-C1-D1-1'1-11'1-111'1-1V'1-V1-V1'1. a10x. Massage lowers 5 min. 84-88
			4:15 P.M. (Number of visitors omitted)	7:45 P.M. As above 84-80
		8:00 P.M. Massage 5 min. uppers and 8 min. lowers. A"1-B"1-C"1-1"1-11"1-11"1-1V"1. (Moves about considerably but unwilling to cooperate further) 92-92	7:30 P.M. Massage as above A"1-B"1-C"1 (Severe headache and unwilling to cooperate further) 84-88	
(6) M. P.	Excellent	None	11:00 A.M. Massage uppers 5 min. Lowers 8min. A'1-B'1-C'1-D'1-L.1'1-11'1-111'1-1V'-R.1'1-11'-111'1 80-75 a10x	10:45 A.M. (Had already done the series once) A'2-B2-C2-D2-1'2-11'2-111'2-1V2-V2-V1'2 a10x 72-78
			5:00 P.M. Uppers as above L.1'1-11'1-111'1-1V'1-V'1-V1'1-R.1'1-11'1-111'1-1V"1 a10x 76-76	3:30 P.M. As above. 75-80 P.M. Went thru above <u>twice</u> in evening
			P.M. Did above alone in evening-of own accord	

PATIENT	3rd	4th	5th	6th
(5) C. M.	10:00 A.M. As preceding except V1"1 92-88 3:30 P.M. A'2-B2-C2-D2 1'2-11'2-111'2- 1V'2-V2-V1'2 a15x-b15x 88-96 5:30 P.M. As above. (Supper came-promised to conclude after, alone) 80-80	10:00 A.M. As preceding 84-88 2:30 P.M. As above 84-88 8:00 P.M. Went thru by herself	Exercises taken twice daily by patient herself-(15x each) First out of bed	As preceding
(6) M. P.	10:00 A.M. (Had already done exercise once) As preceding a15x 76-84 2:30 P.M. As preceding (Exercised very vigorously) 86-96 (Guests came in and she was excited. Had sixteen guests during day) First out of bed	9:00 A.M. (Already done exercises once) A'3-B3-C3-D3-1'3-11'3-111'3-1V3-V3-V1'3 a15x 94-98 4:25 P.M. As above 90-98 Sat up 1½ hrs. in P.M. and hrs. in eve. Walked around room considerably and in corridor. Did not feel weak or dizzy	8:00 A.M. (First day M.P.) A'2-B2-C2-D2-1'2-11'2-111'2-1V2-V2-V1'2 88-108 7:00 P.M. (Moved to infirmary). In discomfort from M.P. no exercise	12:15 P.M. A'3-B3-C3-D3-1'3-11'3-111'3-1V3-V3-V1'3 a15x Up and about. Felt as though could easily go home 5:00 P.M. As above 78-88

PATIENT	ESTIMATE OF COOPERATION	DAY OF OPERATION	1st DAY POST-OPERATIVE	2nd
(7) H. O.	Excellent	4:00 P.M. Massage-uppers 5 min., lowers 8 A'1-B'1-C'1-1'1-11'1-111'1-R.1V"1 66-66	9:00 A.M. Massage as above A'1-B'1-C'1-D'1-1'1-11'-111'1-1V'1-V'1. al0x (painful) 72-78 5:30 P.M. A'1-B1-C1-D1-1'1-11'1-111'1-1V'1-V'1-V1'1 al0x 78-92	9:30 A.M. Suffering from gas pains-had all night-no sleep) As preceding 76-70 4:00 P.M. As above 86-88
(8) R. W.	Good	5:00 P.M. Massage-uppers 5 min., lowers 8 min. A'1-B'1 95x (nausea and vomiting) 76-76	9:00 A.M. Massage as preceding. A'1-B'1-C'1-1'1-11'1-111'1-L.1V"1. al0x 81-78 5:00 P.M. As above, also R.1V"1 102-92	11:00 A.M. A'1-B1-C1-D1-1'1-11'1-111'1-1V"1-V"1 Massage as preceding (no vigor in exercise) al0x 80-80 P.M. As above 84-88
(9) I. K.	Good	3:30 P.M. Massage-uppers 5 min. and lowers 8 min. Uppers A"1-B"1-C"1-1"1-11"1-111"1 (Nausea) 80-100	10:00 A.M. Massage-uppers 3 min., lowers 8 min. A'1-B'1-C'1-D'1-1'1-11'1-111'1 L.1V'1-V'1. al0x 86-88 7:00 P.M. Massage-lowers 8 min. Uppers as above 1'1-11'1-111'1-1V'1-L.V'1. al0x 98-102	11:00 A.M. Massage-lowers 5 min. A1-B1-C1-D1-1'1-11'1-111'1-1V'1-V'1-L. V1'1. al5x 108-88 5:00 P.M. Massage-lowers 3 min. As above 90-88

PATIENT	3rd	4th	5th	6th
(7) H. O.	12:00 A.M. A'2-B2-C2-D2 1'2-11'2-111'2- 1V2-V2-V1'2 a10x 79-84 2:15 P.M. As above 86-86	10:00 A.M. A'3-B3-C3-D3- 1'3-11'3-111'3- 1V3-V3-V13 a15x "Feels fine-much better" 3:30 P.M. As above Coughing considerably 72-84 Evening As above-alone	11:30 A.M. As preceding 68-78 5:00 P.M. As above 80-70 Evening As above-alone	12:00 A.M. As preceding 80-88 "Feels strong enough to be up" 4:00 P.M. As above 64-80 Evening As above-alone
(8) R. W.	As preceding 82-80 As above a15x 88-86	Massage-lowers 5 min. A'2-B2-C2-D2-L'2-11'2-111'2-1V2-V2-1V'2. a15x Repeated above alone-early P.M. 3:30 P.M. As above 84-86	11:30 A.M. Had done preceding early A.M. Developed cystitis-reluctant to do further exercises A'1-B1-C1-D1- 1'1-11'1-111'1- 1V1-V1-V1'1 80-80 First sat up (15 min.)	11:45 A.M. (Had done exercises 10x already) Repeated preceding 88-90 3:15 P.M. A'2-B2-C2-D2-1'2-11'2-111'2-1V2-V2-V1'2. a15x 84-90 (Sat up three hours. Walked with support)
(9) I. K.	9:30 A.M. A1-B1-C1-D1- 1'1-11'1-111'1 1V1-V1-V1'1 a15x 78-80 4:45 P.M. As above 70-70	10:30 A.M. A2-B2-C2-D2- 1'2-11'2-111'2 1V2-V2-V1'2 a15x 76-80 4:30 P.M. As above 80-80	10:30 A.M. As preceding 72-72 4:30 P.M. As above 72-88	9:30 A.M. As preceding 78-82 8:00 P.M. As above First out of bed Sat up one hour in chair

PATIENT	ESTIMATE OF COOPERATION	DAY OF OPERATION	1st DAY POST-OPERATIVE	2nd
(10) C. B.	Fair	5:00 P.M. Massage-uppers 5 min.-lowers 8 min. A'1-B'1-C'1-1'1-11'-111'1 (Rather nauseated) 76-72	11:00 A.M. As preceding, also L.1V'1-R. 1V"1. al0x 64-72 4:00 P.M. A1-B1-C1-D'1-1'1-11'1-111'1-1V'1. al0x 72-82	9:00 A.M. Massage-uppers 3 min. and lowers 5 min. A1-B1-C1-D1-1'1-11'1 111'1-1V'1. al0x 74-90 7:15 P.M. A1-B1-C1-D1-1'1-11'1 111'1-1V 1-V'1-V1'1 (slight assistance on V1'1 on R.) al0x 66-82
(11) S. J.	Excellent	4:30 P.M. Massage 5 min. uppers, 8 min. lowers A'1-B'1-(Nausea) 90-82	12:00 A.M. Massage same A'1-B'1-C'1-D'1-1'1-11'1-111'1-L.1V"1. al0x 96-84 5:00 P.M. As above and R. 1V"1 also 108-112 (in considerable pain from gas)	11:30 A.M. Massage 3 min. uppers, 5 min. lowers A1-B1-C1-D1-1'1-11'1-111'1-L.1V'1-L.V'1-R. 1V"1. al0x 98-106 3:00 P.M. As above adding R.V'1 and R. and L.V1'1 (not full range) 104-112
(12) E. G.	Good	5:00 P.M. Massage 5 min. uppers, 8 min. lowers A"1-B"1. (Nauseated) 106-100	12:45 P.M. Massage as before A'1-B'1-C'1-L.D'1 1'1-11'1-111'1 al0x 110-100 P.M. As above, also 1V'1 104-104	11:30 A.M. Massage 3 min. on uppers, 5 min. on lowers A'1-B'1-C'1-D'1-1'1-11'1-111'1-1V'1 al0x 100-100 7:00 P.M. (In pain) Massage 5 min. uppers 8 min. lowers R.A"1-B"1-L.A"1-B"1-C"1-1'1-11'-111'1 (Patient did not want to do exercises)

PATIENT	3rd	4th	5th	6th
(10) C. B.	9:30 A.M. As preceding 62-74 7:45 P.M. As above 64-64	12:00 A.M. A2-B2-C2-D2 1'2-11'2-111'2 1V 2-V2-V1'2 a10x 60-68 5:00 P.M. As above 66-78	11:45 A.M. As preceding 80-80 3:00 P.M. Same 82-88	12:00 A.M. Same-alone 5:30 P.M. Same-alone
(11) S. J.	11:30 A.M. A1-B1-C1-D1- 1'1-11'-111'1 1V'-V 1-V1'1 a10x 88-90 4:00 P.M. As above 96-100	1:00 P.M. A2-B2-C2-D2-1'2 11'2-111'2-1V 2 V2-V1'2 a15x 106-102 4:45 P.M. As above 84-96	11:50 A.M. As preceding 120-114 4:00 P.M. Had sat up in chair 30 min. in A.M. Walked few steps with help, temperature 103^{4o} at 4:00 P.M. No exercise given Pulse 108	9:30 A.M. As preceding 100-92 As above Not up today because of upper respiratory infection, but much better 84-86
(12) E. G.	11:00 A.M. Massage 3 min. uppers, 5 min. lowers A'1-B'1-C'1-D'1 1'1-11'1-111'1 1V'1-V'1-V11"1 120-104 4:00 P.M. As above (Considerable gas pain and emesis. No nourishment except hot water and tea since operation 100-100	1:00 P.M. A1-B1-C1-D1- 1'1-11'1-111'1 1V 1-V 1-V1'1 a15x 82-96 5:15 P.M. As above 82-92	11:30 A.M. A2-B2-C2-D2 1'2-11'2-111'2 1V2-V2-V1'2 a15x 94-88 3:40 P.M. As above 86-94	10:00 A.M. As preceding 88-84 5:15 P.M. As above 94-98

PATIENT	ESTIMATE OF COOPERATION	DAY OF OPERATION	1st DAY POST-OPERATIVE	2nd
(13) H. P.	Excellent	(Not assigned case on day of operation)	8:30 A.M. Massage-uppers 5 min., lowers 8 min. A"1-B"1-C"1 108-100 7:00 P.M. Massage as above A'1-B'1-C'1-1'1-11'1-111'1-1V"1 a10x 108-100	10:40 A.M. Massage 3 min. lowers, 5 min. uppers A'1-B'1-C'1-D'1-1'1-11'1-111'1-1V'1 a10x 88-96 5:15 P.M. As above 100-84
(14) C. W.	Excellent	8:30 P.M. Massage-uppers 5 min., lowers 8 min. A'1-B'1 84-80	12:20 P.M. Massage-uppers 3 min., lowers 5 min. A'1-B'1-C'1-D'1 L'1-11'1-111'1 a10x 84-88 6:50 P.M. Very severe gas pains-treatment omitted	11:30 A.M. Massage-lowers 5 min. A'1-B'1-C'1-D'1-1'1-11'1-111'1. a10x 76-84 7:00 P.M. As above 68-92
(15) R. S.	Excellent	5:00 P.M. Massage-uppers 5 min., lowers 8 min. A'1-B'1-C'1-1'1 11'1-111'1	10:30 A.M. Massage as preceding A'1-B'1-C'1-D'1-L.1'1-11'1-111'1-1V'1-V'1-R.1'1-11'1-111'1 1V'1 80-88 3:30 P.M. As above except added a10x and omitted L.V'1 82-88	10:30 A.M. Massage as preceding A1-B1-C1-D1-1'1-11'1-111'1-1V'1 (Having some gas pain) 72-88 3:45 P.M. A1-B1-C1-D1-1'1-11'1 111'1-1V 1-V 1-V1'1 a10x 76-78

PATIENT	3rd	4th	5th	6th
(13)				
H. P.	10:30 A.M. A'1-B'1-C'1-D'1 a10x (Complained of tenderness along inner thighs L. more than R. No exercise or massage given) 84-76 7:00 P.M. A'1-B'1-C'1-D'1 1'1-11'1-111'1 1V'1-V'1-V1"1 a10x 84-88	11:45 A.M. A'2-B2-C2-D2 1'2-11'2-111'2-1V2-V2-V1'2 a15x 72-72 7:00 P.M. As above 80-80	11:40 A.M. As preceding 68-72 7:00 P.M. As above 92-92	11:30 A.M. As preceding 68-68 8:00 P.M. Same 80-80
(14)				
C. W.	11:20 A.M. A'1-B'1-C'1-D'1 1'1-11'1-111'1 1V'1-V'1-1V"1 Massage 3 min. lowers a10x 72-76 7:25 P.M. A1-B1-C1-D1-1'1 11'1-111'1-1V 1 V 1-V1'1 a10x 76-76	11:45 A.M. (1st day menstrual period-considerable pain) (As preceding but omitted 1V-V-V1) 68-72 4:15 P.M. A1-B1-C1-D1-1'1 11'1-111'1-1V 1 V 1-V1'1 a10x 80-72	12:40 P.M. A2-B2-C2-D2 1'2-11'2-111'2 1V2-V2-V1'2 a15x 88-84 6:40 P.M. As above 76-88	10:30 A.M. A3-B3-C3-D3-1'3 11'3-111'3-1V3 V3-V1'3 a20x (Asked to get up-felt sufficiently strong) 84-96 7:30 P.M. As above 76-84
(15)				
R. S.	11:30 A.M. Same as preceding 74-78 3:00 P.M. Massage-lowers 5 min. Exercises same 76-78	11:00 A.M. A1-B1-C1-D1-1'1 11'1-111'1-1V 1 V 1-V1'1 a10x 80-88 9:00 P.M. A2-B2-C2-D2-1'2 11'2-111'2-1V2 V2-V1'2 a15x 90-96	11:30 A.M. As preceding Patient volunteered that she felt well enough to get up 80-82 7:30 P.M. Same 74-80	10:00 A.M. A3-B3-C3-D3-1'3 11'3-11'3-1V3-V3-V1'3 a20x 80-78 3:45 P.M. As above

PATIENT	ESTIMATE OF COOPERATION	DAY OF OPERATION	1st DAY POST-OPERATIVE	2nd
(16) A. C.	Good	6:30 P.M. Massage 5 min. uppers, 8 min. lowers A"1-B"1-C"1-R. A"1-B"1-C"1-D"1-L.1'1-11'1 111'1 100-90	9:00 A.M. Massage as preceding A'1-B'1-C'1-D"1 1'1-11'1-111'1-1V"5x (Pain on moving leg) 80-82 4:30 P.M. Massage same A1-B1-C1-D1-L. 1'1-11'1-111'1 1V'1-V"1-V1"1 R.1'1-11'1-111'1 1V"1 (Gas pains) a10x 88-88	9:00 A.M. Massage as preceding A1-B1-C1-D1-1'1-11'1 111'1-1V'1V'1-V1'1 a10x 82-78 4:00 P.M. Massage same A1-B1-C1-D1-1'1-11'1 111'1-1V 1-V 1-V1'1 72-82
(17) H. G.	Fair	Patient operated at 8:00 P.M. Emergency case. Not seen until following day	8:15 A.M. Massage 5 min. uppers, 8 min. lowers A"1-B"1-C"1-D"1 L.1'1-11'1-111'1 1V"1-R.1'1-11'1 111'1 68-66 5:00 P.M. Massage same A'1-B'1-C'1-D'1 L.1'1-11'1-111'1 1V'1-V'1-R.1'1-11'1-111'1-1V"1 86-82	9:00 A.M. Massage same A'1-B'1-C'1-D'1-L. 1'1-11'1-111'1-1V'1 V'1-V1"1-R.1'1-11'1 111'1-1V"1 80-84 4:45 P.M. Massage as above A1-B1-C1-D1-L.1'1 11'1-111'1-1V 1-V 1-V1'-R.1'1-11'1 111'1-1V'1-V'1 a10x 84-82
(18) A. T.	Good	Patient operated at 3:00 P.M. Emergency. Not seen until next day	9:30 A.M. Massage 5 min. uppers, 8 min. lowers A'1-B'1 C'1-D'1-L.1'1-11'1-111'1-1V"1 R.1'1-11'1-111'1 74-72	11:30 A.M. Massage same A1-B1-C1-D1-L.1'1 11'1-111'1-1V'1-V'1-R.1'1-11'1-111'1-1V'1 a10x 90-90

PATIENT	3rd	4th	5th	6th
(16)				
A. C.	12:00 A.M. As preceding except massage uppers 3 min., lowers 5 min. 82-88 8:30 P.M. As above but omitted a10x and R.V1 (Complained of pain in incision) 72-80	9:30 A.M. A2-B2-C2-D2-1'1 11'2-111'2-1V2 V2-V1'2 a10x 80-72 4:30 P.M. As above 82-84	9:00 A.M. As preceding Sat up for 20 min. 76-78 5:00 P.M. A3-B3-C3-D3 1'3-11'3-111'3 1V3-V3-V1'3 a15x Sat up and walked three steps	10:00 A.M. Patient did not exercise alone as preceding 4:00 P.M. As above
(17)				
H. G.	11:00 A.M. As preceding 80-75 2:45 P.M. Massage 3 min. uppers, 5 min. lowers A2-B2-C2-D2 1'2-11'2-111'2 1V2-V2-L.V1'2 a10x 82-74	9:30 A.M. As preceding except R.V1'2 added 72-74 4:15 P.M. As above 76-72	9:30 A.M. A3-B3-C3-D3 1'3-11'3-111'3 1V3-V3-V13 a10x 78-82 4:15 P.M. As above 74-82	9:30 A.M. As preceding 72-80 4:30 P.M. As above 72-76
(18)				
A. T.	11:00 A.M. Massage same A1-B1-C1-D1 1'1-11'1-111'1-1V 1-V'1-V1'1 a10x 80-80	9:00 A.M. As preceding 82-86 4:00 P.M. As above 84-92	10:00 A.M. A3-B3-C3-D3 1'3-11'3-111 3-1V3-V3-V1 3 72-76 7:20 P.M. As above 90-94	10:30 A.M. As preceding 76-80 3:45 P.M. As above 84-86

PATIENT	ESTIMATE OF COOPERATION	DAY OF OPERATION	1st DAY POST-OPERATIVE	2nd
(18) continued			4:30 P.M. Massage same A"1-B"1-C"1 D"1-L.1'1-11'1 111'1-1V"1-V"1 R.1'1-11'1-111 '1-1V"1 (Complained of pain in side) 94-90	4:00 P.M. Massage same A'1-B'1-C'1-D'1 1'1-11'1-111'1 1V'1-V"1 a10x 72-76
(19) G. S.	Fair	8:00 P.M. Massage 5 min. uppers, 8 min. lowers A'1-B'1-C'1 D'1-L.1'1-11'1 111'1-1V"1-R. 1'1-11'1-111'1 74-84	12:00 A.M. Massage as preceding A'1-B'1-C'1-D'1 L.1'1-11'1-111'1 1V"1-V"1-R.1'1- 11'1-111'1-1V"1 68-78 5:30 P.M. Massage same A'1-B1-C1-D1-L. 1'1-11'1-111'1- 1V'1-V'1-R.1'1- 11'1-111'1 92-90	8:15 A.M. Massage same A2-B2-C2-D2-L.1'2 11'1-111'2-1V'2- V'2-V1'2-R.1'2- 11'2-111'2-1V'2-V'2 84-88 4:30 P.M. Massage same A'1-B'1-C'1-L.1'1 11'1-111'1-1V'1-R. 1'1-11'1-111'1 a10x (Patient complained of feeling tired) 78-88
(20) H. L.	Good	6:30 P.M. Massage 5 min. uppers, 8 min. lowers L.A'1-B'1-C'1 D'1-L.1'1-11'1 111'1-1V"1-R. A'1-B'1-C'1 a10x 106-86	10:30 A.M. Massage same A'1-B'1-C'1-D'1 L.I'1-11'1-111'1 1V'1-V'1-V1'1 R.1'1-11'1-111'1 1V'1 5:00 P.M. As above 84-86	11:30 A.M. Same massage A1-B1-C1-D1-L.1'1 11'1-111'1-1V 1 V'1-V1'1-R.1'1-11'1 111 1-1V 1-V'1-V1' (6x) a10x 7:30 P.M. Doctor advised no treatment. Some pain in right thigh

PATIENT	3rd	4th	5th	6th
(18) continued	2:45 P.M. Massage 3 min. uppers, 5 min. lowers A2-B2-C2-D2-1'2 11'2-111'2-1V2 V2-V1 2 al0x 82-88			
(19) G. S.	10:00 A.M. A2-B2-C2-D2-L. 1'2-11'2-111'2 1V'2-V'2-V1'2 78-76 3:30 P.M. A2-B2-C2-D2 1'2-11 2-111 2- 1V 2-V 2-V1 2 80-86	8:00 A.M. As preceding 68-80 5:30 P.M. As above (Patient sat up 15 min. and took two steps)	10:00 A.M. A3-B3-C3-D3 1'3-11'3-111 3-1V3-V3-V13 al0x 86-80 P.M. Patient alone A'2-B'2-C'2 D'2-1'2-11'2 111'2-1V'2-V'2 V1'2 al0x	10:00 A.M. As preceding P.M. Alone A'3-B'3-C'3-D'3 1'3-11'3-11'3- 1V'3-V'3-V1'3 al0x
(20)	8:30 A.M. No treatment given because doctor not seen 5:00 P.M. Massage 3 min. uppers, 5 min. lowers A'1-B'1-C'1-D'1 L.1'1-11 1-111'1 1V'1 78-74	8:00 A.M. As preceding 9:00 P.M. Massage 5 min. uppers, 8 min. lowers A'2-B'2-C'2- D'2-L.1'2-11'2 111'2-1V'2-V'1 V1'1 70-76	10:30 A.M. Alone as pre- ceding Sat up one hour P.M. As above	9:30 A.M. As preceding 72-76 3:30 P.M. A'2-B2-C2-D2-1'2 11 2-111 2-1V 2 V 2-V1 2 al0x 70-72

PATIENT	ESTIMATE OF COOPERATION	DAY OF OPERATION	1st DAY POST-OPERATIVE	2nd
(21) M. B.	Excellent	6:00 P.M. Massage 5 min. uppers, 8 min. lowers A'1-B'1-C'1-D'1 L.1'1-11'1-111'1 1V'1-R.1'1-11'1-111'1 a10x 90-86	10:00 A.M. Massage same A'1-B'1-C'1-D'1 L.1'1-11'1-111'1 R.1'1-11'1-111'1 1V'1 86-88 5:00 P.M. Massage same A1-B1-C1-D1 a10x (Patient having such severe pain could not stay on back) 96-88	10:30 A.M. Massage same A2-B2-C2-D2-L.1'2 11 2-111 2-1V2-V2 V1 2-R.1'2-11'2-1II'2- (Patient sat up 15 min.) 84-100 7:00 P.M. A'2-B2-C2-D2-R.1'2 11 2-111 2-1V 2-L. 1'2-11 2-111 2-1V2-V'2-V1 2 88-98
(22) E. S.	Excellent	10:00 A.M. Massage 5 min. uppers, 8 min. lowers A'1-B'1-C'1-D'1 L.1"1-11"1-111"1 1V"1-R.1"1-11"1 111"1-1V"1 a10x 88-86 (omit)	10:00 A.M. See preceding 5:30 P.M. Massage same A'1-B'1-C'1-D'1 L.1'1-11'1-111'1 1V'1-V'1-V1'1 R.1'1-11'1-111'1 1V'1 a10x 100-96	8:30 A.M. Massage same A'1-B'1-C'1-D'1 R.1'1-11'1-111'1-1V'1 V'1-L.1'1-11'1-111'1 1V'1-V'1-V1'1 a10x 102-100 8:30 P.M. A'1-B'1-C'1-D'1-1'1 11'1-111 1-1V 1-V 1 V1'1 a10x 85-88
(23) M. L.	Excellent	5:00 P.M. Massage 5 min. uppers, 8 min. lowers A'1-B'1-C'1-D'1 L.1'1-11'1-111'1 1V'1-R.1'1-11'1-111'1 a10x	8:00 A.M. Massage same A'1-B'1-C'1-D'1 1'1-11'1-111'1 1V'1-V'1-V1'1 a10x 88-92 7:30 P.M. Massage same A1-B1-C1-D1 Lowers same 74-94	10:00 A.M. Massage 3 min. lowers A2-B2-C2-D2-1'2-11 2 111'2-1V 2-V2-V1'2 a10x 70-74 3:30 P.M. As above 72-80

PATIENT	3rd	4th	5th	6th
(21) M. B.	11:00 A.M. A3-B3-C3-D3 1'3-11 3-111 3 1V 3-V 3-V1 3 Moved to infirmary 88-92	A. M. As preceding P. M. As above Up and around all day	As preceding	As preceding Went home
(22) E. S.	11:00 A.M. Massage same A1-B1-C1-D1 1'1-11 1-111 1 1V 1-V 1-V1 1 a10x 88-86 8:00 P.M. As above 88-90	A. M. Massage same A2-B2-C2-D2 1'2-11 2-111 2 1V 2-V 2-V1'2 a10x 92-92 P. M. As above	A. M. A3-B3-C3-D3 1'3-11 3-111 3 1V 3-V 3-V1 3 a15x 84-90 P. M. As above Sat up 15 min. in chair 80-86	A. M. As preceding Sat up two hours and walked all around room P. M. As above 82-92
(23) M. L.	10:00 A.M. Massage 5 min. lowers A2-B2-C2-D2 1'2-11 2-111'2 1V 2-V 2-V1 2 a10x 70-74 3:30 P.M. A3-B3-C3-D3 1'3-11 3-111'3 1V 3-V 3-V1 3 a10x 70-78	11:30 A.M. As preceding Sat up 5 min. Walked to chair and back 64-70 5:30 P.M. As above 70-70	As preceding As above Sat up all day	As preceding Up and around all day

PATIENT	ESTIMATE OF COOPERATION	DAY OF OPERATION	1st DAY POST-OPERATIVE	2nd
(24) M. A.	Excellent	7:30 P.M. Massage 5 min. uppers, 8 min. lowers A"1-B"1-C"1-D"1 L.1'1-11'1-111'1 1V'1-R.1'1-11'1 111'1 90-68	10:00 A.M. Massage 5 min. uppers, 8 min. lowers A'1-B'1-C'1-D'1 L.1'1-11'1-111'1 1V'1-V'1-V1'1 R.1'1-11'1-111'1 1V'1-V'1 a10x 82-80 3:30 P.M. Massage 5 min. uppers, 8 min. lowers A'1-B'1-C'1-D'1 L.1'1-11'1-111'1 1V'1-R.1'1-11'1 111'1 96-100 (Patient very miserable, pain in wound and gas pains) 70-82	11:30 A.M. Massage 5 min. uppers, 8 min. lowers A1-B1-C1-D1-1'1 11'1-111'1-1V 1 V 1-V1'1 a10x P.M. Massage 5 min. uppers, 8 min. lowers A1-B1-C1-D1-1'1 11'1-111'1-1V 1 V 1-V1'1 a10x 86-80
(25) H. C.	Excellent	No massage or exercises Patient reguested it so began next day	A.M. Massage 5 min. uppers, 8 min. lowers A'1-B'1-C'1-D'1 L.1'1-11'1-111'1 1V'1-V'1-V1'1 R.1'1-11'1-111'1 1V'1 a10x 84-78 P.M. Massage as above A'1-B'1-C'1-D'1 1'1-11 1-111 1 1V 1-V 1-V1 1	A.M. Massage 5 min. uppers, 8 min. lowers A2-B2-C2-D2 1 2-11 2-111 2 1V 2-V 2-V1 2 a10x Patient sat up 20 min. Walked few steps. "Felt as tho could do more" 76-82 P.M. As above 76-84

PATIENT	3rd	4th	5th	6th
(24) M. A.	11:00 A.M. Massage 3 min. uppers, 5 min. lowers Al-Bl-Cl-Dl 1 1-11 1-111 1 1V 1-V 1-Vl 1 al0x 72-74 4:30 P.M. A2-B2-C2-D2 1 2-11 2-111 2 1V 2-V 2-Vl 2 al5x 80-86	10:00 A.M. As preceding 4:00 P.M. As above	11:30 A.M. A3-B3-C3-D3 1'3-11 3-111 3 1V 3-V 3-Vl 3 al0x Sat up for 2 hrs., took 3 steps 74-80 5:00 P.M. As above 72-80	A.M. As preceding Sitting up 7:00 P.M. As above 84-90 (Volunteered--"Think I would not have been this strong without exercises")
(25) H. C.	A.M. Exercise as preceding P.M. As above Up and around	A.M. Exercise as preceding 80-80 P.M. As above Patient walking all around	As preceding	A.M. As preceding 68-84 P.M. As above Was away from hospital in the evening

PATIENT	7th	8th	9th
(1) L. N.	10:00 A.M. A1-B1-C1-D1-1'1-11'1 111'1-L.1V'1-R.1V"1 Massage 8 min. uppers a10x (Complained of pain all the time) 92-88 4:00 P.M. Much pain and tenderness and some rigidity in R.U.Q. Not dressings. Hepatitis suspected by Dr. Oschner. Few stitches removed. No exercise on Dr. Oschner's advice.	9:30 A.M. (Felt much better. Relief since stitches removed yesterday) A'1-B1-C1-D1-1'1-11'1 111'1-1V'1-V'1-V1'1 (Would have been willing and able to do much more. Wanted to go on even on right lowers without rest) 96-96 4:10 P.M. A'2-B2-C2-D2-1'2-11'2 111'2-1V'2-V 2-V1'2 (No discomfort) 84-88	Exercises carried out twice daily by patient herself. (15x each)
(2) H. S.	11:30 A.M. Uppers A'1-B1-C1-D1-1'1 11'1-111'1-1V"1 (Note: Complained of much soreness in wound and said unable to move legs) 80-80 4:00 P.M. As above 72-80	10:00 A.M. A'2-B2-C2-D2-1'2-11'2 111'2 (Note: This A.M. Dr. Oschner probed wound and released quite an amount of bloody serum. Had healed perfectly superficially. Pain relieved) 60-60 3:30 P.M. Uppers as above, lowers also 1V'2 (Optimistic again for first time in several days and in no pain) 68-64	Exercises carried out twice daily by patient himself. (15x each)
(3) T. G.	Carried out exercise alone three times daily, at least 15x each	As preceding	As preceding

PATIENT	10th	11th	12th	13th	14th
(1) L. N.	As preceding	As preceding	As preceding	As preceding	As preceding
(2) H. S.	As preceding	As preceding	As preceding	As preceding First out of bed	
(3) T. G.	As preceding	As preceding	As preceding	First out of bed	

PATIENT	7th	8th	9th
(4) H. H.	As preceding	As preceding	As preceding
(5) C. M.	As preceding First walked	As preceding	As preceding
(6) M. P.	8:00 A.M. As preceding 8:00 P.M. As above 72-80	10:00 A.M. Same 72-75 4:00 P.M. Same 76-78 (Stitches removed. Some oozing)	A. M. Same 88-88 Noon Same 72-72 Eve Same 72-76
(7) H. O.	11:00 A.M. As preceding, very vigorously 66-84 4:30 P.M. Same 66-80 Evening Same alone	10:30 A.M. Same 66-70 3:30 P.M. Same 66-82 Evening Same alone	11:00 A.M. Had done 30x alone before First up in wheel-chair 4:30 P.M. Vomiting No exercises
(8) R. W.	10:30 A.M. As preceding (Felt weaker and complained of pain in back and bladder region) 80-88 4:00 P.M. As above except al5x omitted (painful) 84-86	10:00 A.M. Had done preceding alone Up and walked in corridor. Stitches taken out 4:00 P.M. As preceding al0x 92-90 (Still pain in back and bladder)	11:00 A.M. Did exercises alone. Was up in chair, walked little in corridor. Still discomfort due to cystitis 4:00 P.M. As preceding 90-104 (Had much company and tired) Eve As above alone

PATIENT	10th	11th	12th	13th	14th
(4) H. H.	As preceding	As preceding	First out of bed	As preceding	
(5) C. M.	As preceding	As preceding	As preceding Went home		
(6) M. P.	A. M. Same 72-75 P.M. Omitted (Acute respiratory infection. Temperature)	A. M. Same 72-76 Noon Same 88-109 Eve Same 70-70	Felt ill with "cold" Eve As preceding 72-72	Symptoms preceding operation not entirely relieved. Told to remain quiet.	Stomach pumped. Discharged from infirmary
(7) H. O.	10:30 A.M. Vomited in A.M. Nauseated. No exercise all day. (Dr. Schmidt diagnosed as colitis with regurgitation. Felt sure exercise <u>not</u> the cause)	11:30 A.M. A'1-B1-C1-D1 1'1-11'1-111 '1-1V 1-V 1 V1 1 al5x Feels better but weak 82-86 5:00 P.M. As above Feels better but afraid to eat. Up in chair 1 hr. 78-94	10:00 A.M. As preceding-alone 4:00 P.M. As above 64-86	As preceding-alone 4:00 P.M. As above Walking about ward	
(8) R. W.	11:00 P.M. Had done as preceding (Was up in chair) 4:45 P.M. As preceding al5x 98-96	11:00 A.M. (Been walking-got into bed alone) As preceding 68-80 4:30 P.M. Had done as above alone (Can walk fairly well, but hard to straighten up)	10:00 A.M. Still discomfort due to cystitis. Preferred not to exercise	As preceding-alone 3:00 P.M. As preceding 78-78	Went home

PATIENT	7th	8th	9th
(9)			
I. K.	9:15 A.M. A3-B3-C3-D3-1'3-11'3 111'3-1V 3-V 3-V1'3 a15x 8:15 P.M. As above 76-80 P.M. (Sat up 2½ hours. Walked all around room with assistance. Stitches out)	9:30 A.M. As preceding 100-92 5:30 P.M. As above-alone Sat up 6 hrs. Walked few steps alone	11:30 A.M. As preceding 72-82 P.M. Went home
(10)			
C. B.	11:00 A.M. As preceding 72-74 3:30 P.M. As above-alone	10:00 A.M. As preceding Sat up one hour in chair. Walked a little 4:30 P.M. As above	
(11)			
S. J.	9:40 A.M. As preceding Walking around ward 4:30 P.M. As above 66-80	9:45 A. M. As preceding-alone 4:30 P.M. Same	10:00 A .M. A3-B3-C3-D3-1'3-11'3 111'3-1V 3-V 3-V1'3 a15x 76-84 P. M. As above-alone
(12)			
E. G.	9:30 A.M. As preceding 94-106 3:45 P.M. As above 92-94	9:30 A.M. A3-B3-C3-D3-1'3-11'3 111'3-1V 3-V 3-V1'3 a15x 88-94 As above-alone Sat up in chair 30 min. Did not walk. To infirmary	10:30 A.M. As preceding 84-88 1:00 P.M. As above

PATIENT	10th	11th	12th	13th	14th
(9) I. K.					
(10) C. B.					
(11) S. J.	10:00 A.M. As preceding 66-74 4:00 P.M. As above-alone				
(12) E. G.	12:30 P.M. As preceding 86-100 5:00 P.M. As above				

PATIENT	7th	8th	9th
(13)			
H. P.	11:30 A.M. As preceding 64-64 8:00 P.M. Same	10:30 A.M. Same-alone 7:20 P.M. Same First sat up in chair-20 min. 76-72	9:15 A.M. A'3-B3-C3-D3-1'3 11'3-111'3-1V 3 V 3-V1'3 a20x Up 30 min. Walked across room and back without help 68-72 8:30 P.M. Same 72-72
(14)			
C. W.	11:00 A.M. As preceding 88-96 7:00 P.M. Same 84-96	10:30 A.M. Same Sat up 30 min. Walked in room 84-96 7:00 P.M. Same Sat up one hour. Walked three or four times around room 78-102	8:30 A.M. Same 80-92 4:30 P.M. Same Walked considerably 76-86
(15)			
R. S.	9:30 A.M. A3-B3-C3-D3-1'3-11 3 111 3-1V 3-V 3-V1 3 a10x Stood and took one step to chair (help) 69-80 3:30 P.M. As above 76-72	A. M. Sat up three hours. Walked around room. Not tired. "Felt fine" 3:30 P.M. Exercises as preceding Walked all around halls in eve 68-86	9:15 A.M. As preceding 76-86 2:00 P.M. As above-alone
(16)			
A. C.	Same as preceding day	Went home	

PATIENT	10th	11th	12th	13th	14th
(13) H. P.	10:00 A.M. Same Walked around room without help 68-68 8:00 P.M. Same	10:00 A.M. Same 72-72 7:00 P.M. Same 68-68	9:00 A.M. Same 70-70 7:30 P.M. Same 74-74	8:30 A.M. Same 72-72 7:00 P.M. Same 72-72	Went home (Considerable distance on train)
(14) C. W.	Walked all around hospital. Drove home 100 mi. by automobile				
(15) R. S.	A. M. As preceding 3:30 P.M. Went home				
(16) A. C.					

PATIENT	7th	8th	9th
(17) H. G.	11:30 A.M. As preceding-alone (Sitting in chair and feeling fine) 3:30 P.M. As above	11:00 A.M. To infirmary. Walked all around and "feeling fine".	
(18) A. T.	11:15 A.M. As preceding Walked in hall 78-82 3:30 P.M. As above-alone	10:00 A.M. To infirmary. Does exercises alone. Walks alone As above	A. M. As preceding P. M. As preceding, repeated two times
(19) G. S.	As preceding day-alone Walking all around	As preceding	As preceding
(20) H. L.	Went home		
(21) M. B.	Returned to hospital for removal of stitches. "Feels fine"		
(22) E. S.	A. M. As preceding To infirmary P. M. Same	A. M. As preceding P. M. As above	As preceding Went home
(23) E. L.	A. M. As preceding 76-82 P. M. As above	As preceding Went home	

PATIENT	10th	11th	12th	13th	14th
(17) H. G.		Went home			
(18) A. T.	A. M. As preceding P. M. As preceding	A. M. Minor operation	Patient considered that she felt too ill to do exercises alone	Same as preceding	Same series of exercises twice daily Home on 15th day
(19) G. S.	As preceding	Went home			
(20) H. L.					
(21) M. B.					
(22) E. S.					
(23) E. L.					

PATIENT	7th	8th	9th
(24) M. A.	A. M. As preceding 86-86 P. M. Patient walking all around Omitted exercises	A. M. A3-B3-C3-D3-1'3-11 3 111 3-1V 3-V 3-V1 3 a15x "Feel fine, can walk very well" 68-84 P. M. Tonsillectomy	A. M. Patient looked well. Omitted exercises. P. M. Walking all around. Stitches removed. Omitted exercises
(25) H. C.	Discharged		

PATIENT	10th	11th	12th	13th	14th
(24) M. A.	A. M. Patient discharged Said she was feeling fine				
(25) H. C.					

PATIENT	DATE FIRST UP OUT OF BED	SUBJECTIVE REACTION	DATE WENT HOME
(1) L. N.	Dec. 27, 1926 (13th day)	"Weak and dizzy"	Retained in hospital for further treatment of G.U. condition.
(2) H. S.	Dec. 27, 1926 (13th day) (postoperative)	"Felt fine sitting in chair, but could not stand up on feet"	Dec. 31, 1926 (17th day post-operative)
(3) T. G.	Dec. 29, 1926 Walked to bath (13th day post-operative)	"Fine. O.K." Felt as tho could have done more. Never used wheelchair	Was retained for anti-luetic treatment. Walked little every day after Dec. 29. Always felt could have done more.
(4) H. H.	Dec. 30, 1926 (12th day post-operative)	"Little weak in knees and hips. Otherwise O.K. Sat up 30 min."	Jan. 1, 1927 (14th day postoperative)
(5) C. M.	Dec. 23, 1926 (5th day post-operative) (Walked Dec.25)	"Tired, but no numbness or discomfort or dizziness"	Dec. 30, 1926 (12th day)
(6) M. P.	Jan. 10, 1927 (3rd day post-operative) Sat up in chair 15 min. Stood alone and got back into bed alone	"Knees did not feel weak. Felt slight prickling in feet. Felt tired afterward and slept well"	Jan. 21, 1927 (14th day) Strong enough to have gone many days earlier, but had acute cold and retained for further study of persistent symptoms.
(7) H. O.	Jan. 20, 1927 (9th day post-operative) Sat up about 1 hr. in wheelchair. "Walked Jan. 24, 1927"	"Felt fine. Thinks could easily have walked"	Was retained in hospital because gastro-enterostomy closed. Reoperated Feb. 7, 1927. Stood 2nd operation well.

PATIENT	PATIENT'S ESTIMATE	OBJECTIVE OBSERVATIONS
(1) L. N.	"Always feel better after the exercise, although I am tired when you go!"	Believe the patient's condition thruout was always influenced by the G.U. condition. She had no subjective improvement after returning home.
(2) H. S.	"Feeling fine. Getting stronger each day!" (Jan. 3rd)	Believe duration of convalescence definitely influenced by collection of serum in incision and by sore throat of about five day's duration.
(3) T. G.	Considers he had a fine recovery. Always enjoyed the exercise.	Always seemed strong enough to do more than amount required. Wanted to continue straight thru without any rest periods.
(4) H. H.	"Feeling as good as ever. Can walk quite well, but when go upstairs have to go slow". (Note from home)	Dr. Schmidt noted his excellent condition on first day up and considered that he had a very good recovery. Patient always remarked to us and to others that he enjoyed the exercises and looked forward to doing them.
(5) C. M.	Resumed duties Jan. 4, 1927. Felt that she tired more easily for first few days, otherwise very well.	Dr. Schmidt noted a very excellent recovery. Skated by Jan. 15, 1927.
(6) M. P.	Patient felt wonderfully well and strong from third day on. Thought she was able to go home much sooner. Always considered that she felt better after the exercise.	Seemed to be a remarkably fast recovery. Patient enjoyed exercise, and even the first day postoperative she went thru the exercises an additional time of her own accord. Dr. Schmidt considered her recovery excellent.
(7) H. O.	Patient always enjoyed the exercises and never wanted to rest. No follow-up for remained in hospital for second operation.	Difficult to judge of results, for patient was doing nicely until food failed to pass by either pylorus or gastro-enterostomy opening to any degree, after which he had intermittent nausea and emesis.

PATIENT	DATE FIRST UP OUT OF BED	SUBJECTIVE REACTION	DATE WENT HOME
(8) R. W.	Jan. 16, 1927 (5th day post-operative) Sat up in chair 15 min. Walked with support Jan. 17, 1927	"No numbness nor prickling in legs or feet". (Abdominal discomfort afterward due to cystitis)	Jan. 25, 1927 (14th day)
(9) I. K.	Feb. 14, 1927 (6th day post-operative) Sat up in chair 1 hr. Walked about room with assistance on Feb. 15, 1927	Dizzy when first on feet. Tired when back to bed.	Feb. 17, 1927 (9th day postoperative)
(10) C. B.	Feb. 20, 1927 (8th day post-operative) Sat up in chair 1 hr. and walked a little.	Tired afterward but did not feel very weak at the time.	Feb. 24, 1927 (12th day postoperative)
(11) S. J.	Feb. 22, 1927 (5th day post-operative) Sat up in chair 30 min. and walked few steps with help. Walking all around ward on Feb. 24, 1927	Did not feel weak or dizzy when first up.	March 2, 1927 (13th day postoperative)
(12) E. G.	Feb. 25, 1927 (8th day post-operative) Sat up in chair 30 min. Did not walk. Walked little on Feb. 26	Did not feel very tired but did not want to try to walk. Not dizzy when first walked.	March 5, 1927 (16th day postoperative) (Going home involved trip of considerable distance on train)

PATIENT	PATIENT'S ESTIMATE	OBJECTIVE OBSERVATIONS
(8) R. W.	Still tires quickly and has to rest during the day. Patient attributes this to fact that cystitis has not yet cleared up entirely.	Patient was in weakened condition at time of operation, for had eaten only liquids for week preceding and lost eight pounds. Her convalescence was lengthened by the cystitis. Both these factors tended to lengthen her convalescent period.
(9) I. K.	Tired easily the first few days. Went for a drive on Feb. 20 (12th day) and Feb. 21 walked two blocks without feeling tired.	Considering the triple nature of the operative procedure, patient seemingly recovered very excellently in being out of bed on the sixth day and home on the ninth day. Patient always enjoyed the treatments and volunteered that she felt so good afterward that she usually went to sleep.
(10) C. B.	"I most certainly am impressed with the results of your early massage and exercise and believe it helped a great deal in my case". (Volunteered)	Patient was quite willing to take a long bed rest after the operation, and had no desire to attempt to get up as early as his strength unquestionably warranted.
(11) S. J.	"I still do those exercises every day and I also added a few". (Volunteered)	Dr. Schmidt noted her excellent recovery. She was held back somewhat by development of upper respiratory infection which developed on the fifth day.
(12) E. G.	"It was such a relief when I got out of bed the first time to have real feet and legs instead of wooden pegs. I think the exercises have helped make me stronger much sooner. I'm comparing how I feel now with how I did after appendicitis. I still do my exercises about once daily(20x each) and they seem to rest me". (Volunteered 3/11/27)	Patient was in a weakened condition before operation, for she had been in the infirmary for a week preceding, suffering considerable pain and on a diet. Her average weight was 135 pounds and she weighed 121 pounds at time of operation.

PATIENT	DATE FIRST UP OUT OF BED	SUBJECTIVE REACTION	DATE WENT HOME
(13) H. P.	April 13, 1927 (8th day post-operative) Sat up in chair 20 min. Walked alone April 14 (9th day)	"Did not feel dizzy or weak as expected to"	April 19, 1927 (14th day postoperative) Had to go quite a distance on train.
(14) C. W.	April 16, 1927 (8th day post-operative)	Walked first day. Felt could easily have been up sooner and repeatedly asked to be.	April 18, 1927 (10th day postoperative) Drove 100 miles by automobile.
(15) R. S.	March 8, 1927 (7th day post-operative) Sat up 15 min. Stood with help and took one step to chair. Walked all around halls 8th day post-operative.	"Felt weak at first, but not at all dizzy". Did exercises after returning to bed. Volunteered, "I feel more rested now than before the exercises"	March 11, 1927 (10th day postoperative)
(16) A. C.	March 22, 1927 (5th day post-operative) Sat up 26 min. in A.M. and 30 min. in P.M. Took 3 steps.	"Felt no pain or dizziness". Tired when went back to bed.	March 25, 1927 (8th day postoperative)
(17) H. G.	March 29, 1927 (7th day post-operative) Sat up all day, had lunch in chair.	"Felt fine". Said he was not at all tired or weak or dizzy.	April 2, 1927 (10th day postoperative) (Went to infirmary March 30, 1927)

PATIENT	PATIENT'S ESTIMATE	OBJECTIVE OBSERVATIONS
(13) H. P.	Patient wrote after reaching home, "I find myself feeling just fine. I still continue with the exercise and think they have done a lot for me"	Patient made a remarkably good recovery considering preoperative condition. Had had gastrointestinal distress for seven years, and been on an ulcer diet, largely of milk, for seven weeks before admission. Had lost twenty-five pounds in past four months. Always said she enjoyed the exercises. Dr. Evans noted an excellent recovery.
(14) C. W.	Felt fine when arrived home. "Trip didn't hurt me one bit"	Patient had been "run down" and on a "gall bladder diet" for past eight months during which time she lost thirty-five pounds. Considering this she made an excellent recovery, being able to drive one hundred miles (over poor roads for the most part) without fatigue on the tenth day. Always did the exercises very vigorously. Dr. Evans considered that patient made a "remarkably excellent recovery".
(15) R. S.	Patient thought the exercises helped her materially in regaining her strength. She could move easily and did not feel weak and "worn out".	Patient always seemed to enjoy exercises and many times volunteered that she felt better for having done them. Dr. Schmidt noted a good recovery.
(16) A. C.	Back on duty April 4, 1927 (18th day postoperative). Said she felt the exercise had been of benefit to her from the start. Is feeling fine now and doing regular work without any difficulty.	Patient left the hospital feeling strong. She always seemed strong enough to continue exercises and often wanted to do more than regular amount. Dr. Schmidt said he considered her recovery very fine.
(17) H. G.	Patient said he felt strong and was able to be around at home continuously after leaving hospital. Did not return to school. Said he felt the exercises had "helped a lot".	Patient never exerted himself in doing the exercises, but did them regularly and thought they rested him. Dr. Oschner said he considered his recovery good.

PATIENT	DATE FIRST UP OUT OF BED	SUBJECTIVE REACTION	DATE WENT HOME
(18) A. T.	March 29, 1927 (7th day post-operative) Sat up one hour in A.M. and walked five steps. Walked up and down hall three times same P.M.	"Feel fine, not dizzy, although weak"	April 6, 1927 (14th day postoperative) Left hospital on March 30 for infirmary. Second minor operation on April 2 (10th day postoperative)
(19) G. S.	April 6, 1927 (4th day post-operative) Sat up for 15 min. and took two steps.	"Little tired but no dizziness, pain or prickling sensations"	April 13, 1927 (13th day postoperative) To infirmary on April 9, 1927.
(20) H. L.	April 15, 1927 (5th day post-operative) Sat up for one hour in A.M. and one hour in P.M.	Was not at all weak or dizzy. Tired at end of hour in A.M. but was not tired when back to bed in P.M.	April 17, 1927 (7th day postoperative)
(21) M. B.	April 11, 1927 (2nd day post-operative) Sat up for 15 min. and took two steps.	"Did not feel dizzy or weak"	April 15, 1927 (5th day postoperative) Went to infirmary April 12 (3rd day)
(22) E. S.	April 16, 1927 (5th day post-operative) Sat up 15 min. and took two steps.	"Felt fine, not weak or dizzy". Felt as tho could have sat up longer.	April 20, 1927 (9th day postoperative) Moved to infirmary April 18 (7th day)

PATIENT	PATIENT'S ESTIMATE	OBJECTIVE OBSERVATIONS
(18) A. T.	Returned to school April 12, 1927. Said she felt weak for some time after getting home. Always liked the exercises and did them regularly after leaving hospital.	Patient never seemed to have a great deal of vitality and was not exceedingly vigorous in doing her exercises. Dr. Oschner considered her recovery fair. The second slight operation (removal of lipoma) was something of a drawback.
(19) G. S.	Always said he felt rested after the exercises.	Patient did not exert himself greatly. Was enthusiastic about the massage and liked to do the exercises, but was inclined to get tired quickly. Dr. Oschner noted a good recovery.
(20) H. L.	"The exercise rested me from being in bed". "It was never hard for me to move". "Was not very weak after getting home".	Patient did not carry out the exercises very strenuously but always seemed to enjoy them. Dr. Oschner believes the trouble with her right leg due to fear and not pain. He considered her recovery very good.
(21) M. B.	Patient felt "good" when returned home, April 15. He attributes much to the exercises as a means of regaining his strength.	Patient returned to hospital on April 16, his seventh postoperative day, to have stitches removed. Said he "felt fine" and looked very well. Patient always did exercises vigorously, liked to do them and did them whenever he grew tired of bed. Dr. Oschner considered his recovery excellent.
(22) E. S.	Patient was very enthusiastic about her quick recovery. One week after leaving the hospital, she returned to school. Feels that exercises aided materially in regaining strength and causing ease of movement.	Patient always seemed to enjoy exercises and nearly every time made some remark about feeling well. She always moved easily. Dr. Oschner considered her recovery very good.

PATIENT	DATE FIRST UP OUT OF BED	SUBJECTIVE REACTION	DATE WENT HOME
(23) M. L.	April 16, 1927 (4th day post-operative) Sat up 45 min. Walked to chair and back.	"Felt fine" No vertigo.	April 20, 1927 (8th day postoperative)
(24) M. A.	April 26, 1927 (5th day post-operative) Sat up two hrs. Walked to chair (two steps)	Slightly dizzy when first up, then felt strong and could have stayed up longer. Easy to move.	May 1, 1927 (10th day postoperative)
(25) H. C.	April 27, 1927 (2nd day post-operative) Sat up 20 min. Walked a few steps.	"Felt as though could do more"	May 2, 1927 (7th day postoperative)

PATIENT	PATIENT'S ESTIMATE	OBJECTIVE OBSERVATIONS
(23) M. L.	Felt well when at home. Continues exercises and feels that they have helped her to improve and get about.	Patient always looked forward to "exercise time". Did exercises with vigor from the beginning and always said something about liking them and that they made her "feel good". After being up for first time, she spent little time in bed. Was up in chair or walking much of time. Dr. Oschner considered her recovery good.
(24) M. A.	Felt that exercise always rested her and made it easier for her to move afterwards. Said, "I think I could not have been as strong without the exercise". Felt that they aided her materially in withstanding tonsillectomy on her ninth postoperative day. Grew stronger steadily after reaching home.	Since Jan. 1927 patient has been weak and nervous. Admitted to hospital April 13 and remained in bed under observation until April21, when appendectomy was performed. Had tonsillectomy on ninth day and went home on the tenth day. Always enjoyed exercises, did them vigorously and felt better after doing them. Dr. Oschner said she was in good postoperative condition before the tonsillectomy and noted a good recovery.
(25) H. C.	Feels very decidedly that the exercises were of great benefit to him. Thinks they kept him from losing strength. Back on duty the fourteenth day postoperative and feeling well.	Seemed to be an unusually fast recovery. Patient always seemed to enjoy exercises and did them vigorously. Dr. Oschner noted an excellent recovery.

APPROVED

C. R. Bardeen

Dean

June 6, 1927