past; (10) in grave, acute peritonitis, morphin given hypodermically until the respiratory rate is reduced from 10 to 14 per minute and held to this rate until danger is past.

The technic that will deal successfully with the exhausted, infected soldier with a perforation of the intestine will be of equal value to the exhausted civilian patient.

Certain points in technic in contradistinction to general management may be mentioned:

1. Assuming good technic, as compared with a rapid operator a slow surgeon has a high mortality. 2. Sutures are easily tied too tightly. 3. No drainage is required in operations on the small intestine. In operations on the large intestine, drainage may be used, but never in contact with the line of suture. 5. Retroperitoneal infected wounds should be treated by the Carrel method. 5. The abdominal wall may be divided in any direction with impunity. 6. In great emergencies, a temporizing fistula may be made by marsupializing a hopelessly damaged coil. 7. Although not every penetrated abdomen holds perforated viscera, every perforated abdomen should be opened. 8. I have seen patients whose abdominal wall had been torn wide open, and whose intestine was cold, covered with mud, and perforated withal, get well under the management outlined.

CONCLUSION

The principal experiences on which the foregoing summary is based were with the British in Flanders in 1917, and with the American forces in the Argonne in 1918. The outstanding conclusion from this experience is that the general principles which govern the successful handling of the problems of abdominal surgery are the same in military and in civilian practice. A good abdominal surgeon in military surgery will be a good abdominal surgeon in civilian surgery, and vice versa.

VALUE OF CONVALESCENT BLOOD AND SERUM IN TREATMENT OF INFLUENZAL PNEUMONIA *

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The futility of the usual forms of treatment during the epidemic of influenzal pneumonia was early manifest. With a fatality much greater than our common pneumonia, it suggested the pandemics of old when "the pestilence stalked at noon day through the city, and the doomed inhabitants fell like grass beneath its scythe."

Though the causal agent was undetermined, it seemed that the serum of convalescents might possibly contain antibodies in sufficient quantities to influence favorably the course of the disease.

Serum from patients convalescent from scarlet fever was found by Huber and Blumenthal, Von Leyden[1] and others to be of some therapeutic value in that disease, and both experimentally and in human beings the serum of poliomyelitis convalescents is beneficial if used early.[2]

Richardson and Connor[3] recently demonstrated that the serum of patients convalescent from measles conferred a certain amount of immunity.

We did not know at this time that convalescent serum had been used at the naval hospital at Chelsea, Mass., and just as we were starting the treatment, McGuire and Redden[4] published their results.

Our cases were too few in number to determine fully the value of this form of therapy, and the occurrence of a slight epidemic of hemolytic streptococcus cases early in 1919 increased the difficulty of interpreting our results. Yet certain observations were made that may be of interest and from them certain conclusions seem warranted.

Fifty-six patients received injections of convalescent serum, convalescent blood, or both. One other patient had several treatments, but is excluded because he had a large empyema when treatment was instituted.

Since we at first did not have enough serum for all cases, and as the mild ones usually resulted in recovery without any special treatment, we thought the best test would be to treat only those patients who were seriously ill. As will appear, some exceptions to this rule were made.

According to their condition when treatment was instituted, the cases were divided into four groups. This grouping is only approximately correct, as prognosis, at all times difficult, is especially so in an unfamiliar and very fatal malady.

Group A, 10 per cent. of the cases. Very favorable; mildly toxic; small area of pneumonia; no cyanosis nor vomiting; urine negative.

Group B, 19 per cent. Toxic symptoms more marked; pneumonia more extensive; mind clear; little or no cyanosis; seriously ill but recovery probable.

Group C, 30 per cent. Seriously ill; prognosis poor but patient not moribund, beginning gray cyanosis; often delirium; usually albumin and casts in the urine; as a rule, several lobes extensively involved.

Group D, 41 per cent. Very seriously ill; cyanosis, as a rule, marked; usually delirium or stupor; extensive lung involvement, with a rising temperature, pulse and respiration.

In primary pneumonia the respiratory rate in general gives a good index of the seriousness of the infection. In influenzal pneumonia the patient may be very toxic and have a poor prognosis, but with respirations only slightly increased.

In a group of patients selected because of their serious condition, the mortality rate to be significant should be compared with a like number of equally sick untreated patients. So overwhelming was the epidemic that this could not be done. The mortality in 435 cases of pneumonia, including those patients treated with convalescent serum, was 52 per cent.[5] The mortality of the serum-treated patients was approximately 45 per cent, but the prognosis was distinctly bad in over 70 per cent. when treatment was instituted. Twelve of the fatal cases were in Group D, three in

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* From the Walter Reed General Hospital.

* This paper and that of Dr. J. B. Herrick which follows are part of a symposium on "Influenza." The previous papers appeared in the issues of THE JOURNAL for August 2 and 9.

* Because of lack of space, this article is abbreviated in THE JOURNAL by the omission of the case reports. The complete article appears in the Transactions of the sections and in the author's reprints.

* Read before the joint meeting of the Section on Pharmacology and Therapeutics, the Section on Pathology and Physiology and the Section on Preventive Medicine and Public Health at the Seventieth Annual Session of the American Medical Association, Atlantic City, N. J., June, 1919.

1. Kolmer, J. W.: A Practical Text-Book of Infection, Immunity and Specific Therapy, Philadelphia, W. B. Saunders Company, 1915.

2. Amoss and Chesney: J. Exper. M. **25**: 581 (April) 1917.

3. Richardson, D. L., and Connor, Hilary: Immunization Against Measles, J. A. M. A. **72**: 1046 (April 12) 1919.

4. McGuire, L. W., and Redden, W. R.: Treatment of Influenza Pneumonia by the Use of Convalescent Human Serum, J. A. M. A. **71**: 1311 (Oct. 19) 1918.

5. Feil, E. W.: Postinfluenzal Psychoses, J. A. M. A. **72**: 1658 (June 7) 1919.

Group C, and in only one, a pregnant woman, did the prognosis seem fairly good. She aborted; the temperature reached normal, but death ensued (Case 8).

Of the favorable cases (Groups A and B) the mortality was less than 25 per cent.

In a few cases which ended in recovery following the use of convalescent blood or serum, it did not seem that the outcome was in any way influenced by the treatment. We accordingly have listed these as unimproved in the classification appearing below.

There was a difference of opinion among the medical officers at the hospital as to the merits of the treatment. Lieut. A. D. Rood,[6] in charge of the general pneumonia ward, considered it to be without value. Capt. Sothorne Key, the ward surgeon of the officers' ward, thought highly of it. Major Randolph, chief of the medical service, felt that in some cases it was of real value. As the medical officer who was directing this investigation, I appreciated the fact that the favorable results obtained in the officers' ward were not duplicated in the general ward. The reason for the difference, however, was not apparent until the two groups were studied separately.

The accompanying table shows that in 80 per cent. of the patients in the general pneumonia ward the prognosis was poor at the time the serum was administered, and 60 per cent. seemed quite hopeless. In the officers' ward, on the other hand, the prognosis was unfavorable in 62 per cent. and utterly bad in only 22 per cent. The enlisted men had had their pneumonia 5.4 days when treatment was started, while the patients in the officers' ward had been ill only 3.9 days.

Lamb and Brannin,[7] in studying the epidemic at Camp Cody, found that death occurred, on an average, at the end of 4.9 days after the onset of the pneumonia.

In the officers' ward, notwithstanding the fact that in 62 per cent. of the cases the prognosis was unfavorable, 72 per cent. of the patients showed definite improvement, while in the general ward only 17 per cent. were benefited.

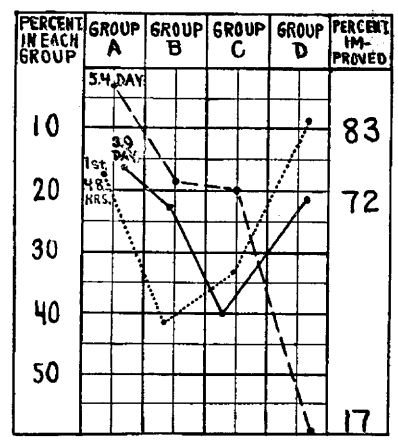

Chart 1.—Importance of early treatment: Groups A, B, C and D refer to the patients' condition when treated, A being most favorable, D least so. The first column shows the percentage in each group. Broken line, patients ill 5.4 days when treated; 60 per cent. in Group D, of whom 17 per cent. only improved. Solid line, patients ill 3.9 days; only 22 per cent. in Group D, while 72 per cent. were benefited by treatment. Dotted line, twelve patients ill not over two days; 8 per cent. were in Group D, and 83 per cent. showed definite improvement.

RESULTS OF TREATMENT IN TWO GROUPS OF CASES, AND THE DETERMINING FACTORS

	Number of Cases	Condition When Treated* A Per Cent.	B Per Cent.	C Per Cent.	D Per Cent.	Day of Disease	Definite Improvement Per Cent.
Officers and Stat. Off.	32	16	22	40	22	3.9	72
Pvts. and N.C.O..	24	4	16	20	60	5.4	17

* A, B, C and D refer to the prognosis, A being very favorable, B, C and D increasingly bad.

All patients admitted to the wards for officers immediately came under the ward surgeon who was to have charge of them, and serum was frequently given within a few hours after admittance. All cases going to the general medical wards first went to the receiving ward where after a careful examination and short period of observation they were sent to their proper destination. This was deemed necessary to detect the contagious diseases and to avoid filling up the pneumonia ward with various other acute respiratory diseases. But a disadvantage existed in that the pneumonia patients often did not arrive in the pneumonia ward till from twelve to twenty-six hours after admittance. When the cause of the difference in the results in the two wards became apparent, treatments were given in the receiving ward; but by this time the epidemic had nearly subsided.

It is noteworthy that all who have written on the treatment of influenzal pneumonia, irrespective of the agent used, state that good results are obtained only when treatment is given early; that is, within the first two or three days of the disease.

In twelve of our cases, treatment was given within forty-eight hours after the appearance of the pneumonia. One patient had a beginning empyema when treated. Of the eleven remaining, all except one (90 per cent.) recovered. The fatal case was a hemolytic streptococcus infection.

McGuire and Redden[8] had an exceptional opportunity to observe the effect of convalescent serum in a small but virulent epidemic of influenza that developed among the officers and crew of the *Yacona*. Twenty cases of bronchopneumonia developed in eighty patients with influenza. All were promptly treated with serum, and all except one recovered.

In the first cases treated we used the serum obtained after allowing the blood to clot. Later we adopted the suggestion of Hartman[9] and collected blood in sodium citrate solution. The serum thus obtained is plasma, but, for the sake of simplicity, is called by the more common name. Twenty-eight patients, in 59 per cent. of whom the prognosis was unfavorable, received a total of forty-nine injections of serum, and definite improvement resulted in half. Five of this group who did not improve developed a hemolytic streptococcus infection. One died from a pneumococcus Type IV meningitis.

In ten cases, seventeen injections of citrated blood of pneumonia convalescents were given. Six patients received only one injection, three received two each, and one was given five. In eight of the ten patients the prognosis was poor, in two utterly hopeless. The two last mentioned died, but five of the other six who were seriously ill definitely improved. The only patient not seriously ill who did not improve developed an empyema.

In eighteen cases at least one injection of convalescent blood and one of convalescent serum were given. The fact that all required more than one treatment

6. Rood, A. D.: New York M. J. **109**: 493 (March 22) 1919.
7. Lamb, F. H., and Brannin, E. B.: The Epidemic Respiratory Infection at Camp Cody, N. M., J. A. M. A. **72**: 1056 (April 12) 1919.
8. McGuire, L. W., and Redden, W. R.: Treatment of Influenzal Pneumonia by the Use of Convalescent Human Serum, J. A. M. A. **72**: 709 (March 8) 1919.
9. Hartman, F. W.: New Methods for Blood Transfusion and Serum Therapy, J. A. M. A. **71**: 1658 (Nov. 16) 1918.

would indicate that they constituted a more unfavorable group than the other two. The prognosis was bad in 83 per cent., and only 39 per cent. showed improvement.

The number of injections required to obtain the desired result is of interest. The chance of recovery is inversely proportionate to the number of treatments required. Of twenty-seven patients in whom marked improvement was noted, fourteen required only one treatment, five received two (the second injection was probably unnecessary in two cases), and five required three treatments. Only one patient received four treatments who was benefited, and two who received as many as five showed improvement. The last two had been ill a long time and received small amounts of serum. Had larger amounts been used, it is possible that fewer treatments would have been required.

McGuire and Redden[8] used only one injection in one third of their cases, and of the remainder, two thirds needed only two. We used from 100 to 150 c.c. of serum; from 300 to 400 c.c. of whole blood was usually used, though in a few of our earlier cases amounts of less than 100 c.c. were employed. One of our most striking cases was in this group (Case 1). When blood was used, donor and recipient were always typed for agglutinins. This is not necessary with serum. Pooled serum was used in about one half the cases. We obtained the blood when the temperature had been normal about ten days, depending on how seriously ill the patient had been. Officers, their wives and nurses, gave their blood as willingly as did the patients in the general ward.

EFFECT OF CONVALESCENT SERUM ON THE SYMPTOMS AND COURSE OF THE DISEASE

Conscious patients in whom the influenza symptoms were marked, experienced relief, almost without exception, in a few hours. Headache and malaise would cease and a number of times severe vomiting of several days' duration promptly stopped (Cases 2 and 20). The detoxication was quite a definite thing. I talked with many officers and nurses during convalescence, and with hardly an exception they said they "felt entirely different" after the treatment. Cyanosis when not extreme would show improvement within twenty-four hours (Cases 3 and 4). One intensely jaundiced patient showed a remarkable clearing up of his jaundice within forty-eight hours after his treatment (Case 5).

The slight clouding of the sensorium frequently present was usually dissipated, but only occasionally did the patients who were delirious show a prompt clearing of consciousness. The rule was for the temperature, pulse and respiration to begin to fall, reaching normal in from thirty-six to forty-eight hours, depending on whether there was a chill. No change would be noted in the mental picture until from twenty-four to thirty-six hours later.

No improvement took place in the mental condition of one patient who had a complicating empyema and was much disoriented for weeks, though he received six treatments. He ultimately recovered. Ross and Hund,[10] using convalescent citrated blood, found that the temperature reached normal 1.5 days after the treatment and 9.5 days after the outset of the disease, while, with the untreated patients, the temperature did not become normal till the fifteenth day.

10. Ross, C. W., and Hund, E. J.: Treatment of the Pneumonic Disturbances Complicating Influenza, J. A. M. A. **72**: 640 (March 1) 1919.

It was the rule that no extension of the pneumonic process took place after improvement in the symptoms occurred. A similar observation was made by McGuire and Redden. In a few cases, however, after a slight though definite improvement, a rapid extension followed with a fatal termination as a rule. One officer who showed such an extension into the only uninvolved lobe again showed prompt improvement and recovered when another treatment was given (Case 6).

Cowie and Beaven,[11] as a rule, found an increase in the signs following the use of typhoid vaccine.

The physical signs often would show no improvement until several days after the temperature, pulse and respiration had reached normal and all symptoms had subsided. In fact, the roentgenologist not infrequently would consider the patient still very critically ill, or even progressing, from a study of the daily negatives, when clinically he was quite convalescent.

After seeing the lungs at postmortem, it is difficult to understand how organs exhibiting so little normal tissue can continue to function, and it is even more remarkable that recovery sometimes takes place.

REACTIONS

Transfusions of normal citrated blood for various conditions are followed by a chill in about 20 per cent. of the cases.[12]

A reaction took place in twenty-three (16 per cent.) of our series of 140 intravenous injections. It is quite possible that a few patients may have had a slight reaction that escaped notice. The reaction was such as is seen following the injections of various foreign proteins. Within half an hour the patients feel chilly, and then have a shaking, followed by an elevation of temperature. In only one instance did the temperature go very high, and then 107 was recorded. As a rule, the temperature rapidly fell, reaching normal in about twelve hours.

Reactions occurred with about equal frequency with whole blood and with serum.

O'Malley and Hartman,[13] using plasma, report a "response," usually a chill and sweat, in 75 per cent. of their cases, and the improvement was more prompt when the reaction took place.

RESULTS OF REACTION

In the great majority of instances, coincident with the fall in the temperature following the chill, the pulse and respiration dropped and there was marked clinical improvement. This took place with such regularity that we considered a chill a good omen. But in the case of four patients, all very ill, the reaction may have hastened their death (Case 7). It seems possible that the severe reaction in Case 3, reported by Cowie and Beaven,[11] following an injection of typhoid antigen, may have hastened the fatal outcome, though they do not suggest this possibility. A severe reaction in a very sick patient is not to be regarded lightly. It may save his life, and it may hasten his death.

In the case of two of our patients who were treated at the same time, with serum a week old, marked flushing of the face accompanied the reaction (Cases 7 and 8). The serum was perfectly clear and sterile and free

11. Cowie, D. M., and Beaven, P. W.: Nonspecific Protein Therapy in Influenzal Pneumonia, J. A. M. A. **72**: 1117 (April 19) 1919.

12. Lewisohn, R.: Am. J. M. Sc. **157**: 253 (Feb.) 1919. Pemberton: Surg., Gynec. & Obst. **28**: 262 (March) 1919.

13. O'Malley, J. J., and Hartman, F. W.: Treatment of Influenzal Pneumonia with Plasma of Convalescent Patients, J. A. M. A. **72**: 34 (Jan. 4) 1919.

from any preservative. With this exception, the serum used was rarely over two days old. The blood was never over twenty-four hours old, and as a rule it was used within twelve hours. Blood not used when obtained was put into serum at the end of twenty-four hours, or sooner, if the donor and recipient were not compatible.

Prior to a few years ago, it was assumed that the reaction resulting from the injection of an antigen was a specific one. The improvement in chronic arthritis following the reaction induced by the intravenous injection of typhoid antigen demonstrated that bacteria in no way responsible for the pathologic condition could cause a reaction that might be followed by improvement. Yet these "nonspecific" reactions may be more specific than at first appears. It is, indeed, quite possible that they furnish the incentive for the production of specific antibodies.

Beneficial results have been reported in various conditions employing a variety of foreign protein.

Cowie and Beaven[11] were able to produce a reaction in influenzal pneumonia which in several instances was followed by improvement by injecting typhoid antigen.

Lamb and Brannin[7] observed improvement following the injecting of a variety of foreign protein, but only when a chill was produced.

Roberts and Cary[14] employed a vaccine made of pneumococci, Types I, II and III, streptococci and staphylococci; and when a reaction was produced, improvement usually followed.

It is noteworthy that in 80 per cent. of our cases in which definite improvement was shown, there was no reaction which is suggestive of specificity.

Nineteen patients received injections of blood or serum from healthy individuals who had not had influenza or pneumonia. One having an empyema when treated is not considered. In five the prognosis was good (A and B), and 20 per cent. seemed benefited. This is in striking contrast to the 75 per cent. showing improvement in the same type of cases with convalescent blood or serum. In fourteen the prognosis was poor, and in 21 per cent. of these improvement followed. In one very sick patient the result was striking (Case 9). It is therefore evident that except in an occasional case the transfusion of "normal" blood is without benefit, with which opinion McGuire and Redden[8] concur.

Ten patients received serum or blood from patients who had had influenza but not pneumonia. Leaving out of account one patient with a large empyema, there were nine to be reported on. The prognosis was poor in six. Slight improvement followed in one case, and in two others, in both of which a chill occurred, there was marked improvement (Case 11). In all, twenty injections of blood or serum of influenza convalescents were given, and in four (20 per cent.) a reaction occurred.

On the assumption that the pneumonia following influenza might be due to secondary organisms, possibly the pneumococcus, we decided to try the effect of transfusion from healthy adults who had not had influenza or pneumonia, and who had been vaccinated with the triple vaccine prepared at the Army Medical School.

Notwithstanding the fact that almost all of our pneumonia cases belonged to Type IV, we thought this worthy of trial because Cecil and Austin[15] found that vaccination against the first three types appeared to diminish the number of Type IV infections. Blood was obtained a week following vaccination, as, at that time, immune bodies are at their maximum.

In seven cases the "normal" immunized blood or serum was given, but in only one case did improvement follow (Case 12). This was a lobar pneumonia with a high leukocyte count, and as the serum was administered on the fifth day, it is possible that the falling temperature was the normal crisis. In this connection it is of interest that Cecil and Vaughan[16] found that prophylactic vaccination with the pneumococcus lipovaccine did not lower the mortality in influenzal pneumonia.

Two patients with a hemolytic streptococcus pneumonia were given transfusion from patients convalescent from hemolytic streptococcus tonsillitis. One showed no improvement; the other had two injections, both being followed by a chill, and recovery took place (Case 13).

STUDY OF THE LEUKOCYTE COUNT

Uncomplicated cases showed the leukopenia so characteristic of the disease. A steadily rising count usually heralded the advent of an empyema. It did not seem that the degree of leukopenia afforded any trustworthy guide as to the prognosis, though a very low count indicates a general infection.

Notwithstanding that many counts were made, our records are not sufficiently complete to be of much value. It so happened that nearly all of the cases in which complete studies were made before and after injections proved to be hemolytic streptococcus cases.

Ross and Hund[10] found that there was a rise in the leukocytes following the transfusion of convalescent citrated blood, which in some cases reached 24,000. A fall to normal was observed as further improvement took place. They do not state whether any difference was observed in the patients who reacted with a chill and in those without a reaction. An increase is commonly found following a protein reaction. In one of our cases the leukocytes rose from 3,300 to 23,000 following a sharp chill occasioned by the transfusion of convalescent blood.

In another case in which there was no reaction following the injection of 300 c.c. of convalescent blood, the leukocytes rose from 5,700 to 13,400 by the end of twenty-four hours. A patient who received 200 c.c. of "normal" serum without reaction or notable improvement showed the following count: before treatment, 5,100; first hour after, 5,100; second hour, 5,700; twenty-four hours later, 4,200.

An increase in the number of leukocytes was noted in some who died, while some showed a falling count. In others there was no change. Following three injections of convalescent serum given in one case during twenty-four hours without reaction but with well marked clinical improvement, the leukocytes rose from 3,000 to 11,300.

The intense congestion of the lungs that characterizes this malady affords an ideal site for the growth of various organisms, the most dreaded being the hemolytic streptococcus. The longer the patient is ill, the greater becomes the danger of the infection. It is perhaps significant that hemolytic streptococcus

14. Roberts, Dudley, and Cary, E. G.: Bacterial Protein Injections in Influenzal Pneumonia, J. A. M. A. **72**: 922 (March 29) 1919.

15. Cecil, R. L., and Austin, J. H.: J Exper. M. **28**: 19 (July) 1918.

16. Cecil, R. L., and Vaughan, H. F.: J. Exper. M. **29**: 457 (May) 1919.

infections were more frequent among the patients treated with "normal" blood than among those receiving convalescent blood.

Of eleven cases in which convalescent blood or serum was given during the first forty-eight hours of the pneumonia, in one a hemolytic streptococcus complication developed. Nineteen patients were treated on the third or fourth day, and eight died. Seven came to necropsy, and five showed the hemolytic streptococcus as the predominant organism. On the other hand, Lamb and Brannin[7] felt that the hemolytic streptococcus did not increase the mortality of influenzal pneumonia. We did not observe any difference in the results obtained with citrated blood, plasma or serum. Whole blood is to be preferred possibly on theoretical grounds, as the introduction of a considerable number of healthy blood corpuscles that will probably continue to function for some time might furnish material aid to the sorely taxed red cells of the recipient.

Cases of hemolytic streptococcus infections were fewest after the use of convalescent whole blood; but, as our series was small, too much significance should not be attached to it.

Specificity of action, which our cases suggest, is not borne out by the work of Lesné[17] and his co-workers, who have been investigating the action of citrated plasma. They believe that it acts as a foreign protein, and they found that patients injected with "normal" plasma or with their own plasma did as well as when convalescent plasma was used. Their series was small, and they appear to have produced a reaction in nearly all of their cases.

When laboratory facilities are at hand, the use of whole blood is simpler and quicker, as it takes only a few minutes to determine the iso-agglutinins. Plasma is obtained by allowing the citrated blood to stand several hours; no grouping of recipient and donor is required, and the serum from several donors can be pooled, which is of advantage.

It does not seem necessary at this time to describe the method of obtaining the blood and administering the treatment, as this has been taken up in detail by several writers on the subject.[18] To insure a supply of fresh serum, each patient when treated should promise to give some blood when convalescent.

SUMMARY

1. Fifty-six patients with influenzal pneumonia, in 70 per cent. of whom the prognosis was poor, were treated with the blood or serum of convalescent patients with a mortality of approximately 45 per cent.

2. Twelve cases were treated within forty-eight hours after the development of the pneumonia. One patient had a beginning empyema when treated; another developed a hemolytic streptococcus infection and died; and one other died. The remaining ten showed prompt improvement and recovered.

3. Thirty-two patients had been ill with pneumonia for an average of 3.9 days when treated, and 72 per cent. showed distinct improvement.

4. Of twenty-four patients ill 5.4 days when treated, 17 per cent. showed improvement.

5. Nine patients, six of whom were seriously ill, were treated with blood or serum of patients convalescent from influenza but who had not had pneumonia. Only two exhibited well marked improvement following the treatment, and both reacted with a chill.

6. Nineteen patients received transfusions of blood or serum from individuals who had not had influenza or pneumonia. No better results were obtained in the cases in which the prognosis was favorable than in the serious cases. Twenty per cent. seemingly were benefited.

7. Nine patients were given blood or serum from healthy adults vaccinated a week previously with triple pneumonia vaccine. In only one case, a lobar pneumonia with a leukocytosis, did improvement follow.

8. Sixteen per cent. of our patients treated with convalescent serum reacted with a chill and rise of temperature. With but four exceptions prompt improvement followed the reaction. In four critically ill patients, death was possibly hastened by the reaction.

9. In 80 per cent. of the cases in which definite improvement was shown no reaction was manifest.

10. Over half of the patients showing improvement required only one injection to obtain the desired results.

CONCLUSIONS

1. The transfusion of "normal" blood or serum is only exceptionally of value in influenzal pneumonia.

2. The blood or serum from individuals vaccinated against pneumococcus Types I, II and III possesses no advantages over "normal" blood in this type of pneumonia.

3. Too few patients were treated with convalescent influenza serum to warrant definite conclusions. The impression received was that it was less potent than convalescent pneumonia serum but of more value than "normal" serum.

4. The transfusion of blood or serum from convalescent influenzal pneumonia patients is occasionally of value though used as late as the fifth day of the disease. When used early, within the first three days, a distinct improvement in all symptoms is to be noted in the majority of cases. It seems to lower the mortality, shorten the course of the disease, and diminish complications.

5. The early employment of convalescent serum, therefore, appears to be a therapeutic measure of definite value.

902 Main Street.

17. Lesné: Presse Méd. **27**: 181 (April 7) 1919.
18. Compare Footnotes 4, 7, 8 and 9.

TREATMENT OF INFLUENZA BY MEANS OTHER THAN VACCINES AND SERUMS *

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This brief paper will be essentially an expression of personal opinion as to the treatment of influenza by means other than serums or vaccines. This opinion is based on an experience with the disease in the epidemic of 1889 and 1890 and the years immediately following, as well as in the epidemic through which we have just passed. Experiences of other physicians, as revealed by personal communication and by observation of their practice, are also laid under contribution. Many articles on the subject have been read, but no claim is made that the enormous mass of literature that has resulted from the visitations of this serious disease has been

* Read before the joint meeting of the Section on Pharmacology and Therapeutics, the Section on Pathology and Physiology and the Section on Preventive Medicine and Public Health at the Seventieth Annual Session of the American Medical Association, Atlantic City, N. J., June, 1919.