I.—GENERAL ANALYSIS AND SUMMARY OF 229 CASES OF TYPHOID FEVER.

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By WILLIAM OSLER, M.D.

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I.—GENERAL ANALYSIS AND SUMMARY OF THE CASES.

By WILLIAM OSLER, M.D.

To May 15th, 1893, 229 cases of typhoid fever were treated in the medical wards.

The patients are isolated in Ward I only when violently delirious or for some special reason.

The following statistical details relate to age, sex, race, etc.

Sex.—187 cases were males and 42 females.

Race.—21 cases were Africans and 208 white.

Of the 208 whites the nationality was as follows: Native Americans 77, Germans 70, Irish 18, English 10, Scotch 2, Russians 4, Scandinavians 8, Poles 4, Bohemians 9, Italians 1, Syrian 1, Finn 1.

The very large proportion of foreigners is in part explained by the situation of the Hospital in a district with a large foreign population, particularly of Germans; and in part is owing to the fact that a large majority of the native Americans have their own homes, and prefer, even in cases of protracted illness, to look after their sick. The ratio of colored to white was 1 to 11.4. The average for 18 years in the city was 1 to 4.2.* The ratio of colored to white in the hospital is about 1 to 7.

Ages.—5 to 15, 23; 15 to 20, 51; 20 to 30, 109; 30 to 40, 29; 40 to 50, 10; 50 to 60, 4; 60 to 70, 3.

Thus it will be seen that nearly 50 per cent of all the cases occurred in the third decade.

Mortality.—Of the 229 patients, 22 died, 9.6 per cent, which is an average rate of mortality, perhaps a little lower than is common in general hospitals. Since the introduction of the cold-bath treatment the mortality has been 7.1 per cent. The various circumstances and conditions influencing the mortality will be dealt with in the consideration of the fatal cases.

* Annual Report of the Health Department, 1892.

Season.—Typhoid is essentially an autumnal fever, and more than one-half of the admissions were in August, September and October. The admissions in each month were as follows:

January 9, February 5, March 3, April 5, May 8, June 9, July 22, August 40, September 38, October 40, November 34, December 16.

The average duration of stay in hospital for the 229 cases was 28.1 days. The majority of the patients are persons without regular homes, and their stay is sometimes unusually protracted; a convalescent from typhoid fever is allowed to remain until he feels well enough to go out and work.

The distribution of the cases in the city will be dealt with in a special section (VIII). Only one case originated in the hospital. A nurse, Miss R. (Hos. No. 3729), had been on night duty from August 1st in ward F, in which was a large number of cases of typhoid fever, and she superintended the giving of from seven to eight baths every night. Prior to August 23rd, when she went off duty, she had been for two weeks "out of sorts" with occasional headache and felt very tired and weak. There was nothing whatever in the history to indicate that she had taken the disease outside, and so far as we knew she had not been exposed except in her duty.

Another nurse had typhoid fever, but just previous to the attack she had been outside nursing a brother with the disease.

A doubtful case was that of Sallie R. (Hos. No. 4716), who was admitted February 16th, 1892, with a choreic affection and spasms. From February 16th to March 1st, 13 days, she had a normal temperature; then from March 1st to 7th there was a gradual rise each day (with the exception of the 5th), the temperature registering a little higher than the last. She gradually developed a typical attack of typhoid fever. She was a resident of Hopkins, Accomack County, Va., but a week before her admission had been staying at Barre Street, in a house, however, in which there was no typhoid fever. In the next bed to her was a patient with typhoid fever, but it is quite possible, and indeed probable, that she received the infection outside, as the fever developed within the limits of the period of incubation.

II.—TREATMENT OF TYPHOID FEVER.

By WILLIAM OSLER, M. D.

(*a*) *Nursing and Diet.*—Since typhoid fever, like a majority of the specific infections, runs a course uninfluenced by any known medicines, the duty of the physician is to see that the patient is properly nursed and fed, and that dangerous symptoms, should they arise, are combated by appropriate remedies. In hygienic and dietetic measures his activity is incessant; so far as drugs are concerned his attitude is best expressed in the term "armed expectancy," giving no medicine simply because the patient has a fever, but in emergencies using suitable remedies with promptness and decision. He advocates, as Sydenham said of Hippocrates, "the support of enfeebled and the coercion of outraged nature."

A large proportion of all cases—75 per cent at least—recover under any and all forms of treatment, and even without the good nursing and regulated diet upon which we lay so much stress. By judicious care, by careful feeding, and by the withholding of drugs of uncertain value, fifteen additional patients in each hundred are saved, and if any reliance can be placed upon figures, an extra three or four per cent are saved by hydrotherapy. Nursing and diet are the supports in which we trust, the essentials under all circumstances, to which is added the cold bath, when possible, or cold sponging, for the antipyretic action and stimulating effect. Medicines are not, as a rule, indicated. No known drug shortens by a day the course of the fever; no method of specific treatment or of antisepsis of the bowel has yet passed beyond the stage of primary laudation.

Good nursing not only means comfort—in all implied in that word—to the patient in innumerable little ways, but it also lessens materially the chances of those complications and accidents which claim so large a percentage of the fatal cases. The mortality has, I believe, been materially influenced by the introduction into hospitals of trained nurses, and would probably be found lowest in those institutions in which the percentage of nurses to patients is found the highest.

Name: E—— T——.

Date: JANUARY 13, 1893. 21ST DAY OF ILLNESS. (RECOVERY.)

Hour.	Temp.	Pulse.	Resp.	Urine.	Stool.	Medicine, Baths, etc.	Stimulant.	Nourishment.	Remarks.
1.30 a. m.				285 cc.			Sherry ʒ ii Brandy ʒ ii	Milk and lime water ℥ ii	
2.00 "	103.8°	140	28			Sponge bath			
3.00 "	103.8°	136	24				Sherry ʒ ii Brandy ʒ ii		Vomited greenish matter.
3.30 "								Albumen ℥ iii	
4.00 "						Strychnia gr. $\frac{1}{60}$			Slept between 4 and 5.30 a. m.
5.30 "	103.4°	120	24	280 cc.			Sherry ʒ iv		
6.00 "						Sponge bath	Sherry ʒ ii	Beef juice ℥ ii	Has resisted taking nourishment all night, but was made to take full amount and has not vomited.
8.00 "	103.4°	140	24			Strychnia $\frac{1}{60}$	Sherry ʒ iv		
10.10 "	104°	140	24			Bath at 70°	Sherry ʒ ii	Albumen ℥ iii	Stood the bath well.
12.00 "	102.6°	144	26				Sherry ʒ ii	Beef juice ℥ ss	
1.30 p. m.				200 cc.			Sherry ʒ iv		
2.00 "	104.3°	148	26		at 2.35	Bath at 70°			Vomited a little.
3.00 "							Brandy ℥ ss	Albumen ℥ i	Stood bath well.
3.30 "	103.6°	120	24				Sherry ʒ ii		
4.00 "						Strychnia $\frac{1}{60}$			Vomited a little bile.
6.00 "	105.0°	158	24				Sherry ʒ iii	Albumen ℥ i	Vomited 60 cc. of bile and mucus.
7.15 "						Bath at 70°	Sherry ʒ iv		Stood bath well. Pulse 160 in tub.
8.00 "	104°	140	24			After bath strychnia $\frac{1}{60}$			Vomited a little bile.
8.30 "								Wine whey ʒ ii	
9.15 "								Beef juice ʒ vi	Retained.
9.30 "							Sherry ʒ iv		Vomited a little bile.
10.10 "				180 cc.					
10.25 "	105°	160	24						
10.45 "						Sponge bath	Brandy ʒ ii		No nausea. Pulse extremely feeble.
11.40 "	104.9°	160	24			After sponge	Brandy ʒ ii		Asleep quietly.
12.00 "						strychnia $\frac{1}{60}$	Sherry ʒ ii		No nausea.
12.30 a. m.							Sherry ʒ ii	Albumen ʒ ii	
12.45 "							Brandy ʒ ii	Albumen ʒ ii	

Milk is the staple article of diet, of which from three to four pints are given in the twenty-four hours. As a rule, it meets all the requirements of an ideal fever food. If not well borne by the stomach it is diluted with lime-water or soda-water, and then the diet is supplemented with egg-albumen or with meat-broths, which are also given when inspection of the stools shows that the milk is not thoroughly digested. Water is given freely and the patient is encouraged to drink as much of it as he can. Alcohol is given after each bath, and in full doses when the fever is high and the pulse feeble. An idea of the dietetic and medicinal measures used to support strength in a serious case may be obtained from the annexed facsimile of the diet and treatment sheet for 24 hours in a case in the middle of a relapse.

(*b*) *The Cold-bath Treatment.*—For years hydrotherapy has been in vogue as a means of combating the more serious symptoms of typhoid fever. Advocated toward the end of the last century by Currie, it has come into general use by the strong advocacy of Brand in Germany and of the physicians of the Lyons school. It is worth quoting here the admirable remarks of the late Professor Nathan Smith, of Yale, who practised hydrotherapy in typhoid fever as early apparently as 1798*: "But the most effectual method of reducing the temperature of the body is by the use of cold water, which may be taken internally or applied externally. When persons, sick of this disease, desire cold water to drink, it should never be denied them—they should be allowed to drink *ad libitum*. The quantity of heat abstracted from the body by the water which they will drink, however, is but small, and except in cases where, by its influence on the stomach, it produces perspiration, its effects are very trifling.

The only effectual method of cooling the body in these cases is by the use of cold water applied externally; by this means we can lessen the heat to any degree we please. Different physicians have adopted different modes of making this application. Some advise to take a patient out of bed, pour buckets of water upon him and then replace him again; while others prefer sponging him with cold water. We have cases where cold water would be of service, in which our patients are too much reduced to be taken out of bed and placed in a sitting posture without injury. In these cases a different management

*A Practical Essay on Typhous Fever. By Nathan Smith, M. D., Professor of the Theory and Practice of Physic and Surgery in Yale College. New York, 1824.

will be necessary. The method which I have adopted is to turn down the bedclothes and to dash from a pint to a gallon of cold water on the patient's head, face and body, so as to wet both the bed and body linen thoroughly. It is better that he should lie on a straw bed when this is done; it is not, however, essential. If his body should be very hot, he may be turned upon his side and the water dashed upon his back.

As soon as his linen and the bedclothes begin to dry, and the heat in the head and breast begins to return to the surface, the water should be again applied, and in this way the heat may be kept down to the natural standard, or rather below, on the surface, so that the skin may feel rather cool to the hand of a healthy person.

It is not very material what the temperature of the water is, if it is below blood-heat, excepting the shock given by its first contact, which in cases where there is much stupor or coma is of some importance; in general the effect is produced chiefly by the evaporation."

During the first year of the hospital work the cases were treated symptomatically, but the remarkable results published by Brand and by the physicians of the Lyons school seemed to make imperative the adoption of hydrotherapy, so that we determined to give it a full and fair trial. Accordingly, Dr. Lafleur, the former first assistant, now of Montreal, after a visit to the wards of Dr. J. C. Wilson at the German Hospital, Philadelphia, began the practice, which for more than a year subsequently received his personal supervision.

1. *Details of the method.*—The patient receives a bath of from 65° to 70° every third hour when the temperature, taken in the rectum, registers 102.5° or over. The temperature of the bath varies somewhat with its antipyretic influence; thus when the fever is very slightly reduced by the bath at 70°, a lower temperature is employed. The temperature is taken every two hours in the rectum, and if it rises above the point mentioned the bath is given. The length of time the patient remains in it varies somewhat, but unless otherwise directed the bath is of twenty minutes duration. The bath tub, of which there are several light portable forms, is wheeled to the side of the bed, around which a ward-screen is placed. In all instances the patient is lifted from the bed into the bath. There is an arrangement for the support of the back of the patient, either a comfortable padded sloping platform or a properly adapted water-cushion. The

water is deep enough to cover entirely the chest. If thought necessary, the patient receives a small quantity of whiskey or a hot drink of some kind. He is lifted into the bath, covered with a sheet or with a folded napkin around the loins. A cloth wrung out of ice-water is placed upon the head, and with a sponge the head and face are kept bathed in the same water. These cold effusions to the head are very important, particularly in cases with marked nervous symptoms. The limbs and trunk are systematically rubbed, either with the hand of the nurse or, what is more convenient, with a cloth or with one of the forms of bath-rubbers now in common use. While the patient is in the bath the bed is prepared for his reception with a rubber sheet, a blanket, and over this an old linen sheet. The patient is lifted out, and in a protracted case with feeble heart is dried at once and wrapped in a blanket. In other instances the patient is tucked carefully in the sheet for from five to ten minutes and covered with the blanket before he is thoroughly dried. The patient is given a hot drink, usually whiskey and water. Half an hour after the bath the temperature is taken and recorded. If at the end of three hours the temperature is again above 102.5° the bath is repeated. During the bath the condition of the patient is carefully watched. Though at first the sensation may be rather agreeable, within five or six minutes the patient usually complains of feeling cold and becomes restless. In a majority of instances shivering begins and the patient's teeth chatter and the extremities and face become a little blue. Systematic frictions do much to counteract shivering and the tendency to cyanosis. Feeble patients are carefully watched, and the duration of the bath is reduced when there are signs of increasing weakness.

The procedure upon which Brand lays, perhaps, the greatest stress, namely, the carrying out of the cold-bath treatment from the very beginning of the disease, by which means alone perfect results can be secured, is of course impossible in hospital practice. Only in most exceptional cases can the treatment be begun before the end of the first week ; thus only 95 of the admissions were in, and usually at the end of, the first week.

We have, however, in this matter always given the patient the benefit of the doubt and have frequently begun the baths before the diagnosis was established, and this way have bathed cases which proved subsequently to be malaria, pneumonia, or pleurisy.

The frequency of the baths depends upon the severity of the case. Four is an average number for the 24 hours, but the maximum number possible, eight, have often to be given. The arrangements are such that they are given in the night as well as in the day. The largest number of baths given an individual case was 147; five cases received more than 100 baths. Though followed as a matter of routine, there have been since we began the treatment five cases in which the patient was admitted in such a state that it was not thought advisable to bathe him; while in eight cases the extreme debility of the patient made us abandon, sometimes for a time only, the treatment.

Brand urges that all cases should be bathed, that every case of typhoid fever, whether grave or moderate, should be treated by the cold bath. This we have not considered necessary, and of the 196 cases admitted since the beginning of the treatment there were 22 which did not receive any baths,—nearly all, except those above mentioned, mild cases in which they did not seem indicated. In but one instance in the entire series did a patient who entered with low temperature subsequently develop serious symptoms with high fever and great prostration. The case is of no little interest, and an abstract of it will be found among the fatal cases, No. 22. We did not really appreciate that he had typhoid fever during the first week in hospital. The temperature chart was very deceptive, and we thought that it might be an anomalous form of malaria, but repeated examinations of the blood were negative. After the enlargement of the spleen and the appearance of a few rose-spots rendered certain the diagnosis of typhoid fever, the temperature did not rise above 102° until the thirteenth day in hospital. The baths were then begun, but the case proved to be one of unusual severity. He took in all 114 baths. Death occurred from perforation on the fifty-first day. One could not but regret that the baths had not been started at the outset.

2. *General results of the treatment.*—Without entering upon a discussion of the theory of the action of the cold bath, the most important effects may be said to be in the reduction of the temperature and in the general stimulating effect upon the patient, particularly upon the nervous system.

Brand's statement that by the cold bath it is possible to keep the patient in an afebrile condition is not borne out by our experience. In a majority of cases the action of the bath is prompt, and within

No. 5900 Davis Martin. Admitted Sept 9th /93 Ward F.

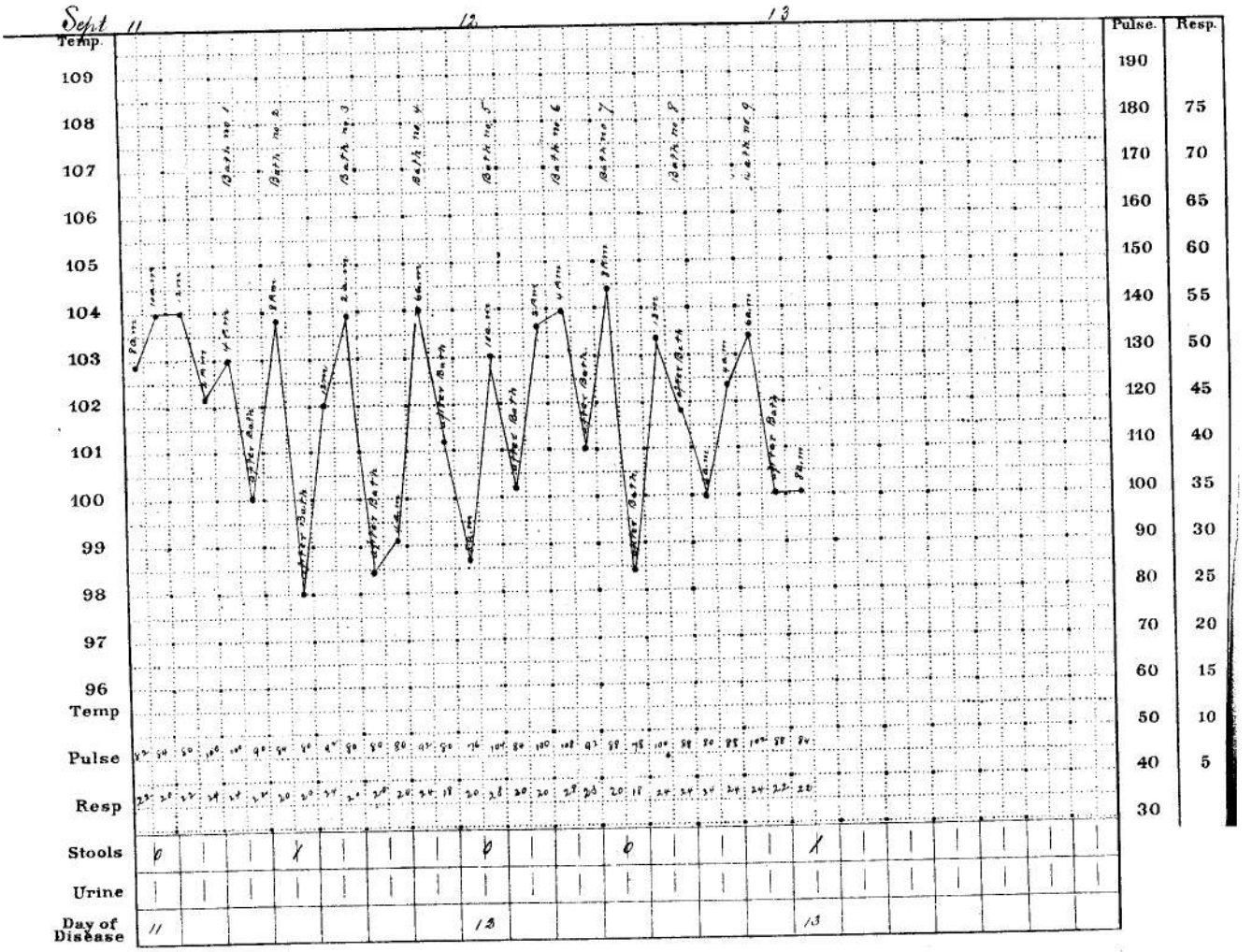

Chart II showing marked action of the baths.

No. 6405 Mary Magraw Admitted Dec 4th /92 Ward C 11

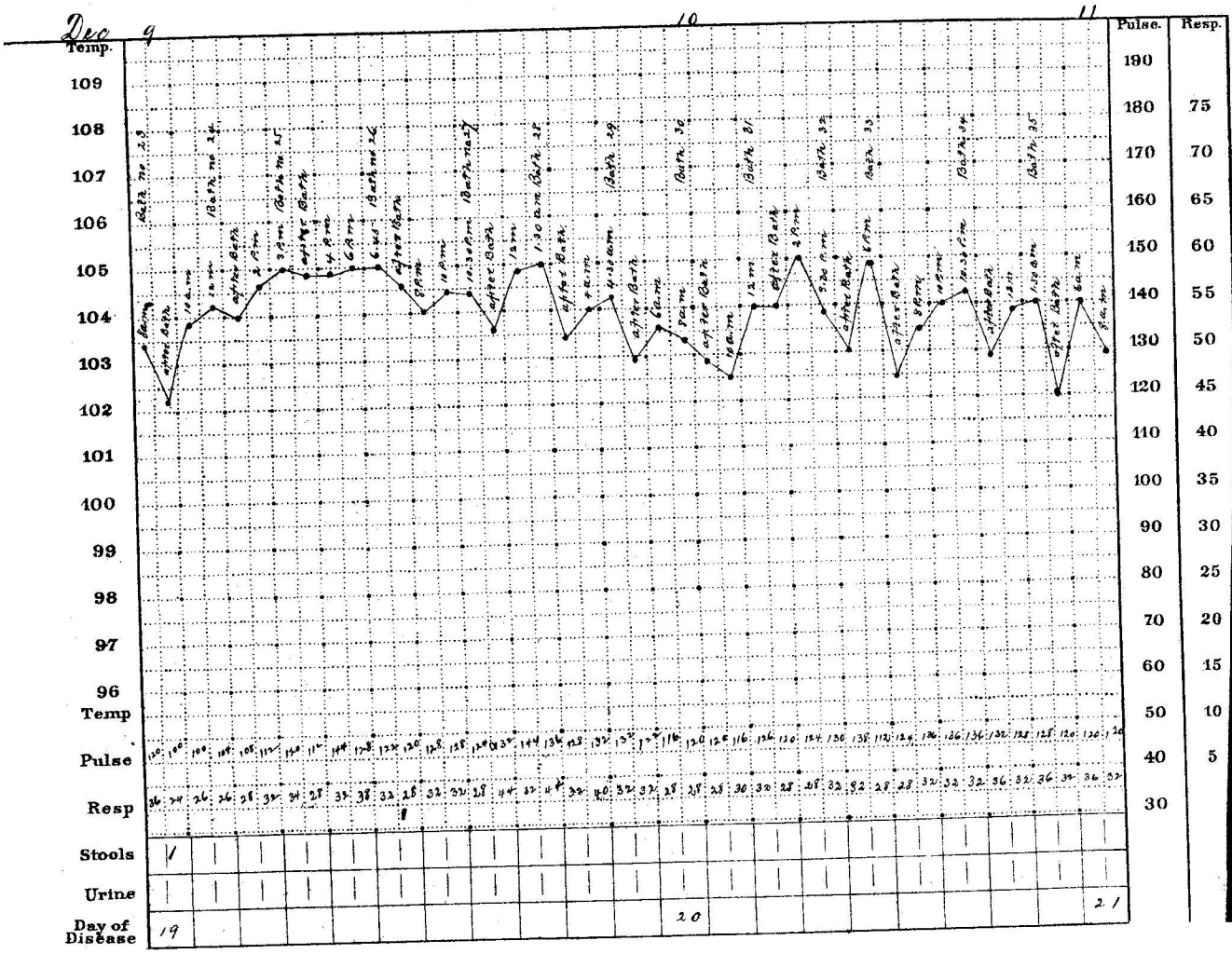

Chart I showing very slight action of baths.

half an hour after the patient comes out of the bath the rectal temperature is lowered from one to three degrees. Then our charts show as a rule a gradual rise, and by the time the two-hourly temperature is again taken the temperature usually has reached its former height. At the height of the disease it is quite exceptional to see the fever kept down for more than a couple of hours. On the other hand there are not a few cases in which the bath at 65° has very little influence in reducing the fever. There were many cases in which at the end of the first or the beginning of the second week, or even later, the baths did not materially influence the fever, that is to say, did not reduce it for more than from a half to one degree. The accompanying chart illustrates this point (Chart I).

On the other hand there are cases in which the bath at 70° acts very powerfully, and on every occasion reduces the temperature to normal or even to 95° or 96°. In children, particularly, this extreme action was seen from the very outset. More frequently it is met with in the later periods, as in the third week. The accompanying temperature chart illustrates the prompt and decisive antipyretic action of the bath in the second week (Chart II).

The cold bath acts in a majority of instances as a tonic to the circulatory system. Within five or ten minutes the pulse of a patient in the bath becomes smaller and the tension is increased. It may indeed become extremely small and hard, a change which is particularly noticeable in cases which present the relaxed, dicrotic pulse. After the patient is put to bed and is shivering and blue from the effects of the bath, the pulse may be even difficult to feel. The frequency may be at this time very considerably reduced. The stimulating tonic effect is particularly seen in the early stage, and it seems to be as much upon the peripheral arterial system as upon the heart itself. In the later stages of the disease, with feeble heart's action and pulse above 120, a tonic action is not so often observed, and the reaction from the bath frequently very slow. Collapse symptoms were present in five of our cases and necessitated the abandonment of the baths, usually only for a time.

On the nervous system the most striking effects are witnessed. The headache is relieved; delirium, stupor and coma are rarely seen; the patient sleeps well and naturally, and tremor is a rare occurrence. Of course there is not a complete absence of all the grave nervous phenomena even when the cases are bathed from the

earliest period. Thirteen patients presented marked nervous features, but this is a very small number in the whole series. Certainly the symptoms to which the term "typhoid" is applied are not nearly so frequent under the cold-bath treatment. Thus, at the time of writing (October 20th) there are twenty-eight cases of typhoid fever in the medical wards, not one of which has or has had delirium or tremor.

On the respiratory system the baths exercise no special influence. They certainly do not aggravate the preliminary bronchitis, and the idea that they are liable to induce pneumonia or pleurisy is entirely groundless.

Patients treated with the cold bath appear less often to have the dry, brown tongue. Gastric irritation is not so frequent. Diarrhœa and tympanites are so variable symptoms in different epidemics that it is difficult to say whether they are specially influenced by the baths, but comparing the series treated with and without the baths, they certainly appear to have a good effect. There were seven cases of hemorrhage in the bathed cases; only one in the thirty-three cases treated symptomatically. The proportionately large number of cases of perforation among the fatal cases was probably accidental and had nothing to do with the treatment.

The number of relapses in our bath series, 9.2 per cent, contrasts strikingly with the entire absence in the small number treated symptomatically. The incidence of relapse ranges in different places from 2 or 3 per cent to 9 or 10 per cent, and it does not seem right to attribute any prejudicial influence to the baths. Complications with the bath treatment are rare, and the only unpleasant one was the skin-boils, which certainly occurred in a greater number of cases than in any series treated by me in other hospitals.

The cold-bath method carried out in all its details is exceedingly onerous, particularly if there is a large number of cases in the hospital at the same time. It is, moreover, to a very considerable majority of all the patients excessively disagreeable, and at least nine out of ten of our patients have complained bitterly of it. So harsh does it often seem that I would not suffer it in my wards for a day did I not feel sure that under its systematic employment the death-rate in the disease was definitely lowered. Results such as published by Brand, in cases treated in garrisons and in private practice, cannot be expected and are not obtained in ordinary hospital work. The mortality in the Red Cross Hospital at Lyons, as given by Tripier

and Bouveret, gives a percentage of 7.3, results not only good in themselves, but brilliant in comparison with the statistics of previous periods, in which the mortality ranged from 16 per cent in one period of nine years, and prior to that a mortality of 25 per cent.

The 33 cases treated symptomatically during the first year of the hospital work had a mortality of 24.2 per cent. The cases, however, were of unusual severity; one was admitted with acute hemorrhagic nephritis, one was admitted at the beginning of the third week and had double pneumonia; two cases died of perforation, and one of hemorrhage from the bowels. The mortality since the introduction of the cold-bath treatment has been only 7.1 per cent.

Of course the number treated is small from which to draw any conclusions, but the total mortality of the bathed cases is certainly very low for general hospital work in this country, the average mortality in typhoid fever ranging from 10 to 15 per cent. Series of 30 or 40 cases may be treated consecutively without a death; thus on one occasion there were 33 cases treated without a death, and on another occasion 37; and 51 were treated consecutively with only one death. Of the 14 fatal cases since the introduction of the bath treatment, one came in during a relapse of unusual intensity and died on the twenty-third day, having in all 67 baths. Three were admitted in the third week, one was admitted on the sixth day, two on the seventh, one on the eighth, two on the ninth, one on the tenth day, one on the twelfth, one on the sixteenth, and in one it was impossible to say how long he had been ill. In one of the fatal cases the condition was thought to be pneumonia in a cachectic old man, but the post-mortem showed it to be typhoid fever.

III.—A STUDY OF THE FATAL CASES.

By WILLIAM OSLER, M. D.

Many circumstances influence the death-rate in typhoid fever, of which the most important are the inherited disposition, the amount and character of the poison, the time at which the patient comes under skilled care, and the mode of treatment.

The variation in symptoms, so striking in the infectious diseases, no one case resembling another in all respects—what is it but the expression of the individual disposition, the personal equation? All are not equally susceptible; some are immune, others seem to have an absence of what have been termed the protective *alexins*. Almost the only definite fact, the only certain point, illustrating individual disposition is the varying incidence of typhoid fever with age. The conditions favoring infection increase with each quinquennial period from the third to the sixth. Not the tender blade, not the bud, but the full flower of early womanhood and manhood falls victim to this scourge. The cases are not only more frequent between the 15th and 25th years, but the death-rate at this period is the highest. Of the 22 fatal cases in our series, 11 were under twenty-five years of age.

Experimental evidence has abundantly demonstrated that the symptoms vary with the dose of a poison, and while analogy would lead us to infer the same in the spontaneous infections, we know nothing of the circumstances influencing the dosage in typhoid fever; not even if the variations depend on the amount of infective material or on differences, at different times and in different places, in the intensity of the virus. The severity and duration of the symptoms, and the termination, whether in death or recovery, are influenced primarily, in a large majority of all cases, by these two factors, viz., disposition, constitution, soil, or whatever we may term it; and the virus, possibly by its relative virulence, possibly by its dosage. Fortunately, spontaneous recovery follows in a majority of the cases in the self-limited infections, such as typhoid, typhus, smallpox, etc. The term *self-limited* implies that the duration is fixed—fixed, we

formerly thought, by an exhaustion of the soil, an absence of the conditions suitable to the further development of the germs; now, as it seems more likely, by the gradual production of substances which inhibit, control and limit their growth—the gradual induction of a tissue-state analogous to that enjoyed by the blood with its germicidal serum.

The mortality is influenced greatly by the time at which the patient comes under treatment. The earlier he takes to bed and is at rest and surrounded by all those accessories of nursing which have come to mean so much in fever cases, the better the chance in the prolonged fight of the *vis medicatrix naturæ* against progressive toxæmia. Ambulatory cases, which take to bed in the second or third week, usually succumb with facility, often becoming rapidly poisoned and showing no rallying powers; as if the energies had been expended in a preliminary aggressive fight, when the victory lay in a defensive, waiting battle. Of the 22 fatal cases 10 were admitted during the first week, 5 during the second week, 3 in the third, and 2 in the fourth. Of the total admissions, 95 were in the first week, 80 in the second, 25 in the third, 8 in the fourth, 2 in the fifth, 1 in the sixth, and in 16 it was impossible to get accurate details as to the duration of the illness before entering the hospital. This gives a percentage of 9.5 deaths in patients in the first week, 6.2 for patients admitted in the second week, 12 per cent for the third, and 25 per cent of those admitted in the fourth week. Of the 16 cases in which it was impossible to speak definitely as to the onset, 2 died.

The greater the care which a typhoid-fever patient receives, the more watchful is the attention to details, the lower should be, *cæteris paribus*, the death-rate. In a medical ward of a general hospital the number of nurses and assistants should bear some ratio to the number of fever cases, particularly to those of typhoid. In the men's medical ward the average staff of nurses and assistants is four with one orderly; in the months of October and November it has risen to seven with two orderlies. Incessant care in carrying out every direction, regularity and system in feeding, bathing and cleansing, and an intelligent appreciation of the significance of symptoms are all-important factors in influencing the death-rate.

Death in typhoid fever is due: (1) To asthenia, a result either of the rapid or slow action of the poisonous toxins, or a sequence of the severe diarrhœa;

(2) To intercurrent affections, usually caused by an invasion of the weakened organism by other parasites, pneumococci, streptococci, etc.; and,

(3) To accidents of the lesion—erosion of a large blood-vessel, or perforation of an ulcer.

Analyzing the 22 deaths according to this division, there came in the first 8 cases, in the second 4 cases, and in the third 10 cases.

I.—Death by Progressive Asthenia.

No case in the list died, so far as one can judge, directly from the effects of the fever, that is, from hyperpyrexia. The highest temperature recorded among the fatal cases was 107°. Nor was there an instance of death from early toxæmia, by which is meant the rapid overpowering of the system, and a fatal result within the first week. Such cases are extremely rare. More commonly the toxæmia is slow and progressive, causing a gradual failure and exhaustion of the strength of the patient, usually but not always with coma and delirium. Of the 8 instances here given 6 died of the progressive toxæmia due to the disease itself. One of these was a case of relapse, and of the others, 1 was admitted on the sixth day, 3 in the second week, and 1 after three and a-half weeks' illness. As a rule there is marked involvement of the nervous system with delirium, coma and tremor. In only one instance, Case III, did the patient retain consciousness to the end. The temperature is usually high, the range from 103°–105°. Sometimes, as in Case III, which was very protracted, the temperature may towards the end sink and be normal or even subnormal. The pulse is always rapid and feeble; thus the range in the six cases was usually above 120, and in every instance rose above 140. The average duration in hospital of these cases was a little more than 12 days. Four of these six patients were bathed. Huxham's* description of this mode of death is particularly graphic: "Now Nature sinks apace, the extremities grow cold, the nails pale or livid, the pulse may be said to tremble and flutter rather than to beat, the vibrations being so exceeding weak and quick that they can scarce be distinguished, though sometimes they creep on surprisingly slow, and very frequently intermit. The sick become quite insensible and stupid, scarce affected with the loudest

*An Essay on Fevers. Second edition, 1750, page 78.

noise or the strongest light, though at the beginning strangely susceptive of the impressions of either. The delirium now ends in a profound coma, and that soon in eternal sleep. The stools, urine and tears run off involuntarily, and announce a speedy dissolution, as the vast tremblings and twitching of the nerves and tendons are preludes to a general convulsion, which at once snaps off the thread of life. In one or other of these ways are the sick carried off, after having languished on for fourteen, eighteen or twenty days, nay, sometimes for much longer."

The cases with progressive asthenia are as follows:

CASE III. *Admission at end of third week. Great prostration, temperature irregular and low, death from exhaustion.*

Annie K., aged 23 (Hos. No. 175), admitted August 3rd, 1889. Married and had four healthy children. Present illness began three weeks ago with pains and fever. On the fourth day of her illness diarrhœa began and she had at first six or seven movements a day. When admitted she was in a very prostrated condition; temperature 102°, pulse 140, dicrotic, and she was delirious. There was herpes about the mouth and nose, the tongue was very dry. The spleen was enlarged, there were no spots seen. Throughout the first week in hospital the temperature showed pretty wide daily variations, as much sometimes as 3° or 4° between the morning and evening temperature. On August 8th and 9th the temperature was extremely irregular and once dropped to normal. She was very apathetic, but conscious. On the 10th, 11th and 12th the fever kept between 103° and 104°, and on the 13th and 14th was normal for 24 hours; thus on the morning of the 13th the temperature gradually fell, and at 6 a. m. was normal. It remained between 98° and 99.5° for 36 hours, then gradually rose, and on the 15th, the day of her death, rose to 103.5°.

The irregular and low temperature in this case towards the close was associated with the most profound asthenia, rapid, feeble pulse, and diarrhœa.

There was no autopsy.

CASE VIII. *Admission in second week. Diarrhœa, delirium and tremor, progressive asthenia, death, autopsy.*

Louis S., aged 28 (Hos. No. 1215), admitted May 5th, 1890. The patient gave a history of illness of about ten days' duration; pains

in the head and back and severe diarrhœa, ten and fifteen stools in twenty-four hours. On admission the temperature was 103°; pulse 108. Throughout the first and second weeks in hospital the case was regarded as one of ordinary severity; the pulse was never very high, not above 98, the temperature between 102° and 104°. On several occasions he had very profuse perspirations. The mind was clear. The diarrhœa, which had been troublesome at first, was checked. About the beginning of the fourth week of the illness the symptoms became aggravated; the pulse became more rapid and feeble, the delirium was marked, and he had very pronounced muscular tremor. It was not until the third day before death, however, that the pulse rose above 100. The heart sounds were clear and there were no complications. On the 15th the tongue became dry and brown, the pulse feebler, and the heart sounds were muffled and very feeble at the apex. Throughout the 16th, 17th and 18th the temperature was between 103° and 104°; he was delirious, and he sank and died on the evening of the 18th.

Autopsy. Anatomical diagnosis: *Typhoid ulcers in every stage of development in the ileum.*

The ileum showed extensive ulceration, most marked near the valve. Higher in the bowel the patches were covered with brownish necrotic sloughs. The mucous membrane of the large intestine was extensively congested. The spleen was much enlarged. The heart muscle was pale and soft, but on microscopical examination did not show fatty degeneration.

In this case the patient had been doing well, had had only moderate fever, the pulse was not high, and of fair volume, and it was not until within four or five days of the fatal issue that the symptoms became in any way alarming. There was nothing in the anatomical condition to account for the sudden development of these more serious symptoms.

CASE X. *Admission late, probably in third week. High fever, meteorism, diarrhœa, gradual exhaustion, death, autopsy.*

Joseph D., aged 43, admitted August 21st, 1890 (Hos. No. 1687). He is a German, has been in this country eight years, and states that with the exception of "abdominal typhus" (which expression he used himself) six years ago, when he was ill for five weeks, has always enjoyed good health. In July he had what he called a sun-

stroke. Four weeks ago he had headache and pain in the abdomen; no chill; no diarrhœa. The headache has persisted and he has had occasional cough. He was seen in the dispensary August 11th, when his temperature was 101.4°, and he was then urged to come into the hospital. On admission mind was clear; temperature 104.5°, pulse 120, dicrotic; first sound of the heart a little feeble and muffled at the apex; abdomen full and a little tender in the median zone; well defined rose spots; spleen not palpable; tongue presents a heavy fur, somewhat dry. Patient was ordered baths and stimulants. For the first two days he seemed pretty comfortable; the temperature tended constantly to rise to 105°, but he took the baths well. On the 26th he had a good deal of tremor; the sensorium remained clear. The abdomen was distended; the tympany on percussion extended as high as the seventh rib in nipple line. Slight tenderness in left iliac and hypochondriac regions. There were 5 cm. of liver dulness in the nipple line. The splenic dulness could not be made out; the edge was not palpable. He was ordered warm enemata with turpentine, and given turpentine internally. On the 27th the abdomen was softer, not distended, not tender on pressure. Rash not so marked, general condition altogether better, though the tongue was dry and the pulse was still 120. On the 28th he was very much worse; pulse 132, and he has had for the past two days more diarrhœa. Throughout the evening he failed rapidly, became very feeble and weak on the 29th and died in the evening.

The urine, on admission, was clear and contained no albumin, but there were hyaline and granular casts. Subsequently the urine contained albumin in a small amount and the granular casts persisted. The albumin was never of such amount as to excite special attention or uneasiness.

This patient had in all twenty-five baths, which he seemed to stand very well and did not make any special complaint.

Autopsy (Dr. Councilman). Anatomical diagnosis: *Typhoid ulceration of ileum, pulmonary collapse with œdema, incipient bronchopneumonia.*

Peritoneum smooth. At the beginning of the ileum, situated in the centre of a Peyer's patch was a circular ulcer 1 cm. in diameter. 300 cm. above the ileo-cæcal valve was the first of a series of ulcers affecting the Peyer's patches and solitary follicles. The first large and deep ulcer was situated 80 cm. above the valve. The patch in

which it was situated was raised above the surrounding parts, and the ulcer was irregular with eroded edges. In only three of the ulcers had the process reached the muscular coat. There were three superficial erosions in the sigmoid flexure.

There were marked œdema and congestion of the lungs at the bases, and throughout the substance were several patches of beginning broncho-pneumonia. The spleen weighed 137 grammes; the kidneys were enlarged; the cortices swollen. In both there were small nodules about 2 mm. in diameter, not raised above the surface, of a yellowish color, and surrounded by a zone of hyperæmia. The heart muscle was of a brownish-red color; the striæ were well marked; no wide-spread fatty change. The valves were normal.

CASE XII. *Admission in relapse. Delirium, high fever, slight hemorrhages, dyspnœa, progressive cardiac weakness, death, autopsy.*

John S., aged 34 (Hos. No. 2983), admitted April 26th, 1891. Patient was a bartender, had always enjoyed good health since childhood. No acute illness until last autumn, when he was ill for three weeks with fever, cough, and pains in the right side and the back. He got better and remained well until eight weeks ago, when he was taken ill suddenly with a chill and fever. He felt very badly and was in bed for six weeks and a half. Was delirious at times. He had no pain, not even headache. About five weeks after the onset he began to sit up. He had been at work for some time (he says three weeks, but that is inconsistent with the former statement), when on the 24th, that is two days ago, he began to feel badly again and had chilly feelings. On the 25th and 26th he had vomiting, with fever and a little nose-bleeding.

The patient is a stout, plethoric, healthy-looking man, and it is difficult to credit the statement which he makes that within the past three months he has spent at least six and a half weeks in bed with a prolonged fever in which he was delirious. He looks now a very ill man. His pulse is 120, tension low, but not dicrotic. The temperature rose in the evening to 104°. Abdomen was large, panniculus thick, skin covered with a very copious and typical rose-red rash. Edge of the spleen distinctly palpable. The heart sounds were clear, the first approaches the second in character. The patient was rational, but at night was delirious. For the first week in hospital the temperature was remarkably continuous, even the two-hourly

temperature showing very little variation between 103° and 105°. It was not until he had had the baths for three or four days that there was much variation in the temperature. The pulse towards the end of the first week became rapid and irregular. The note by Dr. Lafleur states that the baths have had less influence than in any case previously treated. After many of the baths there was no reduction whatever. The delirium persisted; the spots came out in crops. The pulse was rapid, 120 to 140, with very low tension. The note of May 4th is as follows: "He is conscious; there is a little tremor of the hands; tongue is dry; color of face fairly good; respirations labored, 48; there is diarrhœa; the rash is very copious." The dyspnœa was marked; there were wheezing sounds over the lungs in front, and there was slight dulness at both bases, with enfeebled breathing and numerous fine râles. There was no leucocytosis. The red corpuscles were above five millions per cm., the white between five and six thousand per cm., and the hæmoglobin at about 80 per cent. On the 8th he had a small hemorrhage from the bowels, not followed by any fall in temperature. The delirium persisted; heart sounds very feeble and of fœtal rhythm. During the next four or five days he had between six and seven slight hemorrhages, none of large amount. The pulse was extremely feeble and rapid, 140 to 160. He was fed and nursed with the greatest care. On the 14th, which was about the 18th day of his stay in hospital, the note is—"Rash is fading; abdomen is considerably distended; bowel tympany extends about 2 cm. above costal margin; pulse 144; respirations 44. The dyspnœa is not now laryngeal or tracheal. He moves the head constantly from side to side." He sank gradually and died on the 15th.

During the nineteen days this patient was in hospital the temperature is noted as below 102°, in the two-hourly record, only 17 times, this in spite of the most persistent and systematic bathing and sponging. He had in all 67 baths. The temperature was above 104° in the great majority of the records, and it once reached nearly 107°.

The special interest in this case was the definite statement which he made as to a previous attack, and of this, from the accounts of his relatives, there apparently can be no doubt, so that we regarded this case during life as an instance of unusually severe relapse.

Autopsy. Anatomical diagnosis: *Typhoid fever; ulcers with clean bases, and glands in a stage of medullary infiltration; lesions of relapse; catarrhal pneumonia of lower lobes of both lungs; acute enlargement of the spleen; swelling of the mesenteric glands; old tuberculosis of the lungs.*

The body was that of a large, strongly built, well-nourished man; ecchymoses on the arms. Peritoneum smooth. Small intestine presented in the upper part of the jejunum, 100 cm. from the stomach, many points of extreme congestion in the valvulæ conniventes. The upper Peyer's patches in the jejunum were hyperæmic and swollen, without any ulceration. Lower down the solitary follicles were affected as well; some of the Peyer's patches were greatly elevated above the surface and had very sharp edges. The first distinct ulcer was 20 cm. from the valve. It had clean edges, and a base on the muscular coat. Close to the valve was a series of ulcers with perfectly clean bases. In the upper portion of the ileum every stage of change in the glands up to necrosis was present. There were no distinct sloughs in any portion of the intestine; the only lesions were medullary infiltration and the clean-cut ulcers. The mucous membrane of the vermiform appendix was swollen, but not ulcerated. The mucous membrane of the descending colon presented patches of old pigmentation. The spleen was much enlarged, weighing 750 grammes. Mesenteric glands were all greatly enlarged and soft. The liver was enlarged and substance soft. The heart muscle was pale, soft, flabby, no mottling visible; but there was extensive fatty degeneration in the form of very fine molecules. The lung presented at both bases scattered areas of broncho-pneumonia and a few old caseous and tuberculous nodules. A point of very great interest in this case was, whether we could judge from the anatomical lesions the truth of the statements of the friends, and of the man himself, that he had only been a short time convalescent from a protracted fever before the onset of the attack in which he died. At the meeting of the Hospital Medical Society at which the specimens were shown, Dr. Councilman, who performed the autopsy, regarded the condition of the lymphatic elements of the intestine as rather bearing out this view. Extensive clean-cut ulceration in the lower part represented, he thought, the old unhealed ulcers, whereas above they were in a condition of unusually marked fresh hyperplasia. I took the view that the lesions present might have been produced during this attack, which had lasted for exactly three weeks.

CASE XIV. *Admission in third week. Great debility, meteorism, delirium, death, autopsy.*

Sophia H., age 17 (Hos. No. 3967), admitted September 29th, 1891. Patient had been in this country a little over a year. She cannot give a very satisfactory account of herself. A friend stated that she had been ill four weeks. She was complaining for one week, and for three weeks she has been in bed. She had pain in the back and side, fever, no chills, a good deal of diarrhœa and some vomiting.

The patient was well formed, well nourished, had a heavy, dull expression; temperature 102.5°; pulse 102.

Tongue clean at the base. Abdomen was moderately full, tympanitic, everywhere tender on palpation. The spleen was not palpable. One or two small rose spots on the back. Temperature in the evening rose to nearly 105°. The urine, drawn off by a catheter (as she had retention), contained albumin and hyaline casts. During the first week in hospital the temperature constantly tended to the neighborhood of 105°. The pulse was rapid and feeble, reaching 140. She refused nourishment, but took the baths well. She was very restless and even attempted to get out of bed, and was at times quite violent. The abdomen was very tympanitic. On the afternoon of the 6th she was so feeble that the baths were omitted, after she had had in all thirty-three. On the 7th and 8th the temperature kept constantly between 102° and 104°. She was sponged. The abdomen was distended, tense, tympanitic, and on the 7th the liver dulness in the middle and upper sternal lines was obliterated. On the 8th she seemed more rational and put out her tongue when asked, and seemed to understand what was said. There was marked tenderness on slight pressure on the abdomen. The pulse was 140, very compressible. On the 9th the note is: "Patient had a very good day yesterday; she was very quiet; pulse better; face brighter. The tympanites has almost disappeared. On the middle finger of the right hand, just beside the last metacarpo-pharangeal joint, was a reddened, somewhat indurated and very tender spot, and extending along the inside of the finger and the back of the hand is a red streak. This morning the general condition of the patient is worse; the face is more drawn; the pulse is feebler; the abdomen is more tympanitic, though not so distended as it was yesterday, but it is still very tender. On the right outer malleolus is a red, elevated, indurated area 2 cm. in diameter; the centre is hemorrhagic, the skin not raised." Patient sank and died shortly after noon.

Autopsy. Anatomical diagnosis: *Typhoid fever, swelling and necrosis of the follicles in both small and large intestines, catarrhal pneumonia.*

The areas of local inflammation noted in the history were evident post-mortem, and the axillary glands on the right side were somewhat enlarged. The peritoneum was smooth. The diaphragm on the right side was at the third space. The large intestine was greatly distended. In the ileum the solitary follicles were very much swollen and elevated. About a metre from the valve there were some small points of ulceration and superficial necrosis at the apices of the swellings. The uppermost Peyer's patches were swollen; near the valve they were necrotic and stained yellow, and presented large yellow fissured sloughs. The vermiform appendix was swollen and showed superficial necrosis. The large intestine was dilated, and throughout its entire course were numerous small ulcerations. The follicles were swollen and the ulcers evidently proceed from them. The mesenteric glands were enlarged. The spleen weighed 234 grammes. The kidneys were large, somewhat swollen, and microscopically showed fatty degeneration. The heart was small and flaccid, and the muscle showed slight, very diffuse fatty degeneration. The lungs were congested at the bases, and along the posterior borders of the lower lobes showed a few scattered areas of lobular pneumonia.

CASE XVII. *Admission in second week. High fever, extreme cardiac debility, delirium, progressive asthenia, death, autopsy.*

Charles W. S., aged 22, colored (Hos. No. 5540), admitted July 8th, 1892. Patient had been healthy and strong until the present illness, which began, he thinks, about four weeks ago with pains in the legs, weakness and diarrhœa. He did not give up work until six days ago, and went to bed the next day. He had been slightly delirious and had some vomiting. Blood was negative, no leucocytosis. The day before his admission the patient was visited at his home by one of the house-physicians, and found in bed, unconscious, with a temperature of 104.8°. On the 10th, the day after his admission, the abstract of the note was as follows: "Patient is a well nourished man; tongue is covered with a thick, yellowish fur; temperature rose to 105.7° through the night and this morning was 104°. The pulse is 136, low tension. The abdomen is a little full, tympa-

nitic, nowhere tender. The spleen cannot be felt; the heart sounds are clear, but feeble." The patient took his baths well; the temperature was very high during the first week of his admission, often reaching 105° and usually 104° at the time of the baths. On July 12th his condition was such that the baths had to be stopped; the pulse became quite uncountable at the wrist and he became extremely feeble. He was ordered carbonate of ammonia and given alcohol freely and strychnia. He was very dull and drowsy. During the second week in hospital, about the 16th of July, the temperature became lower, and from the 16th to the 20th it did not rise above 102°. The abdomen was not distended. The pulse, however, was very feeble. There were apparently no complications. On the evening of the 20th the temperature rose to 103.5°; the pulse became extremely feeble, and he died on the 21st, the 12th day in hospital.

Autopsy. Anatomical diagnosis: *Typhoid fever; acute splenic tumor; enlargement of the mesenteric lymph glands.*

The lower portion of the jejunum and the ileum presented typical typhoid ulcers, chiefly in the long axis of the intestine. There were twelve of these oblong ulcers, most of them with clean bases extending to the muscular coat. There were two sloughs still adherent. There were no ulcers in the large intestine, but the follicles were enlarged. Mesenteric glands were very greatly swollen. The spleen was only slightly enlarged. The kidneys showed cloudy swelling. The heart muscle was pale and flabby.

In the following instances the fatal event was connected with the intensity of the gastro-intestinal symptoms; in Case II, a young girl aged 15, who was admitted about the 8th day, had moderately high fever, which seemed readily controlled by sponging, and which by the end of the second week had fallen to between 101° and 102°. In the fourth week, when the temperature had reached normal on several occasions, she had very severe vomiting, rejecting everything. The temperature was often subnormal, and she died of the exhaustion consequent upon the persistent vomiting. The other, Case XVIII, is of special interest, from the fact that he had been in hospital a year before with intense entero-colitis, and on readmission the attack was thought to be a recurrence, as the temperature was not very high, and fell almost to normal. The fatal result seemed due directly to the severe diarrhœa.

CASE II. *Admission on 7th day. Delirium, high fever, irregular temperature in third week, persistent vomiting, diarrhœa, parotitis, death, autopsy.*

Barbara L., aged 15 (Hos. No. 150), admitted July 26th, 1889, about the seventh day of her illness, with a temperature of 105.3°. She was a well nourished, healthy-looking girl. The illness began with headaches and cough, and on the 22nd she had a chill. On admission the temperature was 105.3°. She was delirious from the outset, very restless, and had marked nervous symptoms. The temperature was high, and during the first week the daily variations were never more than 2 or 2½ degrees. Towards the end of the second week of the illness the morning and evening temperature was about 102°, and the daily range of the two-hourly temperature not more than 2.5°. Throughout the third week she was delirious; the pulse between 110 and 129, the tongue dry, and on August 6th parotitis began on the left side. She also began to have frequent attacks of vomiting. The fever during the third week was extremely irregular; thus on the 16th day there was a drop in the afternoon to 96.5° without any chill and not following the sponging. It rose in the evening to 103.4°, the highest temperature which she had had for more than a week. Throughout the 17th, 18th and 19th days of the illness the temperature on several occasions was normal, and on the 20th day it was subnormal for the greater part of the twenty-four hours. She had had for several days a good deal of vomiting and was extremely feeble and weak; pulse 142. Throughout the greater part of the fourth week this remarkable condition in the temperature persisted, and throughout the 21st, 22nd and 23rd days the temperature was subnormal for a large part of the time. Thus on August 10th the temperature at 8 p. m. was 99°, at 4 a. m. was 99.6°, at 8 a. m. it had fallen to 95°, at 10 a. m. to 94°; it gradually rose throughout the day, and between 2 p. m. and 8 a. m. the next morning was constantly between 98° and 99°. The next day there was a drop again to 95°. The pulse was during this period not so rapid, but extremely feeble. The vomiting was persistent and followed immediately the taking of food. She was given stimulants constantly, and hypodermics of ether and brandy. On August 15th, the 26th day of the disease, the temperature began to rise, and on the 27th and 28th was between 103° and 104°. Then throughout August 18th, 19th and 20th it remained between 100° and 102°, and on the

latter date she died in a condition of exhaustion. Diarrhœa had been present throughout the illness, the number of stools ranging from two to four daily. It was more marked early than late in the illness. There was never very great abdominal distension and never tenderness. The rash was profuse.

The special features of the case were the great irritability of the stomach during the second and third week, the low temperatures during the fourth week, with which the severity of the symptoms did not in any way abate. The parotitis which developed subsided without suppuration.

Autopsy (Dr. Welch). Anatomical diagnosis: *Typhoid lesions; clean and smooth ulcers and a fresh medullary infiltration; extensive typhoid lesions in large intestine; swollen spleen; hemorrhage into right ovary; cloudy swelling of kidneys.*

No peritonitis. The distribution of the intestinal disease was as follows: The first lesion occurred in a Peyer's patch 197 cm. from the ileo-cæcal valve, and consisted in medullary infiltration with a little slough in the upper part. From this point to the valve the Peyer's patches and follicles were swollen and ulcerated. Near the valve were large ulcers with swollen edges and clean floors, in which the circular muscular coat was evident. The edges of the ulcers were moderately swollen and a little undermined. All of the large ulcers had this clean appearance, without any slough attached; but in or a little outside the edge of the ulcers there were fine, swollen, whitish follicles, looking like a fresh medullary infiltration. The ulcers sometimes had the long axis parallel to that of the coat and sometimes ran transversely. The large intestine was very extensively involved; the mucous membrane from the cæcum to the rectum was thickly studded with whitish, rather firm elevations, apparently solitary follicles the size of a pea or smaller. Many of these had a small central loss of substance, forming crater-like ulcers, or a small yellowish central slough, partly or wholly detached. In the cæcum there were more extensive ulcers, with smooth floors resembling those in the ileum. The mucosa of the vermiform appendix was swollen and presented numerous swollen follicles, but no ulcers or sloughs. The swollen follicles were less numerous in the rectum than in the colon, but they were present, and in some instances ulcerated.

The condition of the heart was interesting in connection with the fact that she had a persistently feeble, though never excessively

rapid pulse. The organ weighed 180 grammes; the valves were normal, and the note by Dr. Welch on the heart muscle is, "microscopically entirely normal; striæ distinct, no trace of granular or fatty degeneration." An interesting accessory condition was the hemorrhage into the stroma of the right ovary.

CASE XVIII. *Doubtful duration before admission. Diagnosis of entero-colitis; severe diarrhœa, death, autopsy, medullary infiltration of Peyer's glands.*

John L., colored, aged 25 (Hos. No. 5556), admitted July 12th, 1892. This patient was in hospital just a year before and was treated for entero-colitis and recovered. He states, however, that he has since had several attacks, for which he has had repeatedly to take laudanum. He sought relief at the dispensary a few days ago for diarrhœa, which has, he says, lasted some time, but it was impossible to fix the date of onset. He has had some nausea and occasional vomiting. The patient was emaciated and had a dull, stupid expression. The tongue was covered with thick white fur. Temperature on admission was 102° and rose to 103.5°. The abdomen was flat. The condition of the heart and lungs was negative. The blood examination showed no malarial parasites. The stools were examined repeatedly; no amœbæ were found. They were thin, of an amber color, and contained gelatinous threads with fæcal masses. Nothing special was seen on microscopical examination. The colon was irrigated and he was given bismuth. During the first three days in hospital he had a great many stools, from nine to ten in the twenty-four hours. Typhoid fever was not suspected, as it was thought he had entero-colitis, such as that for which he was treated a year ago. Moreover, the temperature morning and evening on the day after admission was 99.5°, and only rose once in the day to 101°. Throughout the 14th, 15th and 16th the temperature did not rise above 100°. The only suggestive point was the diazo reaction in his urine. On the 17th the temperature rose to 104° and he became very much prostrated. The diarrhœa was not so severe, but the movements were involuntary, and he gradually sank and died on the 19th.

Autopsy. Anatomical diagnosis: *Typhoid fever, stage of medullary infiltration, acute splenic tumor, parenchymatous degeneration of kidneys and liver.*

Peritoneum smooth. The large intestine was dilated and the walls thickened. From the anus to the cæcum the mucous membrane was covered with small prominences the size of shot. They were all about the same size, most of them firm. Some of the largest had a small depression in the centre. The mucous membrane between these nodules was intensely hyperæmic. In the entire ileum both the follicles in the Peyer's patches were intensely swollen, reddened, or in a stage of medullary infiltration. No sloughs in the intestines anywhere. In the largest of the patches there was a marked reticular appearance, in the smaller a homogeneous swelling; the mucous membrane between them everywhere hyperæmic. The hyperæmia and the relative degree of swelling of the follicles extended half-way up the jejunum. The spleen was large, weighing 235 grammes. The mesenteric glands were very much enlarged. The kidneys were much swollen and pale. The heart muscle was pale, but not fatty. Typhoid bacilli were found in the spleen and mesenteric glands.

A point of special interest in this case is the occurrence of death before the formation either of sloughs or ulcers in the Peyer's glands. This is extremely rare; in every one of 64 autopsies in typhoid fever (Montreal and Philadelphia cases) sloughs or ulcers were present; and in one instance at least, extensive necrosis existed by the end of the first week. In the case under consideration it is impossible to estimate accurately the duration of the illness, but it was probably at least ten days. There was intense colitis, and many of the enlarged solitary follicles showed central losses of substance, and the reticulated appearance was present in the Peyer's patches, so that superficial necrosis had occurred. But a patient may have a prolonged and typical attack with delirium and diarrhœa, and present at the time of death, on the 36th day, only medullary infiltration without sloughs or ulcers. (See Sidney Phillips, Clin. Society Transactions, 18 .)

II.—Death from Intercurrent Affections.

In this class are four cases: one an instance of acute hemorrhagic nephritis, which is referred to in the section on renal complications; two of pneumonia; and one of œdema of the glottis. Of the two cases of pneumonia, one was of particular interest inasmuch as it

was regarded as the primary lesion, and the diagnosis was only established post-mortem. The œdema of the glottis occurred in an unusually protracted case in a pregnant woman. The attack came on somewhat suddenly when she was apparently doing very well and when the temperature was gradually falling.

CASE I. *Onset with rigor, persistent high fever, hæmoglobinuria, delirium, symptoms of perforation, death, autopsy.*

John T., aged 26, colored (Hos. No. 54). Onset with rigor, persistent high fever. Hæmoglobinuria with albumin and tube casts. Delirium, symptoms of perforation; death on 14th day of illness. Extensive lesions in ileum; perforation; acute hemorrhagic nephritis.

This case is fully reported in Vol. II of the Hospital Reports, page 120, and will be referred to in this report in Dr. Hewetson's paper on the kidney complications.

CASE V. *Admission at end of second week. Marked cardiac arrythmia, pneumonia, death, autopsy.*

Johann R., aged 32 (Hos. No. 469), admitted November 2nd, 1889, from one of the ships of the Hamburg-American S. S. Co. There was a history of an illness of two weeks' duration, with fever and diarrhœa and slight cough. He persisted in keeping about and trying to do his work.

On admission he was rational; temperature 102°, pulse 78, very irregular and intermittent. The color was good, he had no dyspnœa and no cardiac distress. There were some petechiæ on the skin of the abdomen and a few rose spots. The heart condition was unusual, and for the first twenty-four hours alarming; the impulse was not forcible, but the shock was felt widely, the beats followed each other rapidly, sometimes in pairs or in series of three, four, or five. Many of the beats did not reach the radial. The second aortic sound was clear. So feeble, intermittent and irregular was the heart's action that he was given several times hypodermics of ether, and was at once ordered digitalis and whiskey. The first days in hospital the patient was very restless and delirious. The heart for the first twenty-four hours, as stated, was extremely irregular and the action rapid. The rash became very abundant, the petechiæ gradually faded, the spleen was enlarged; he had troublesome

diarrhœa, five or six stools in a day. The temperature was not high, ranging only from 101° to 103°. After the 6th the digitalis was stopped, as the pulse became regular but more rapid. The patient seemed to be doing well, though he had had diarrhœa and was delirious, until the 7th of November, when signs of pleurisy and pneumonia developed. The temperature rose to 104° on the 7th, and after that did not rise above 103°, though the pneumonia extended rapidly. The reddish-brown sputa contained numerous pneumococci. The pulse became extremely feeble and rapid, the respirations were between 50 and 60, and in spite of ether, ammonia and brandy he sank and died on the morning of the 9th.

Autopsy. Anatomical diagnosis: *Typhoid ulceration in small and large intestines, lobar pneumonia, pleurisy.*

There was extensive ulceration of the large intestine, extending even to the rectum. The ulcers were round and irregular, with, as a rule, clean bases; they involved the entire length of the large bowel. The ileum presented extensive ulceration, particularly near the valve. The upper and posterior portion of the lower lobe of the left lung was consolidated, and in a state of red hepatization. The pleura over it was covered with a thin pellicle of fibrin. The posterior part of the lower lobe of the right lung was also solid, and the pleura presented a similar fibrinous exudate. The spleen weighed 630 grammes. The heart muscle was dark and flaccid. The fibres presented no fatty degeneration.

CASE XI. *Admission in state of extreme debility. Diagnosis of pneumonia; death, autopsy, lesions of typhoid fever.*

Geo. W. K., aged 70 (Hos. No. 1814), admitted September 22nd, 1890, complaining of extreme debility. Patient states that he has been a healthy man, but cannot give a satisfactory account of himself. States that he has not had cough, and that the bowels have been regular; no chills, no vomiting. On admission he was much emaciated, looking in a condition of senile debility. The temperature was 97.5° at 8 p. m., and did not rise above 97° throughout the night. Pulse 72, regular, compressible, radials sclerotic. Tongue very heavily coated, dry and almost black. There were numerous cutaneous hemorrhages about the wrists and legs, and large superficial ones on the skin over the manubrium and scattered over the trunk. The chest is somewhat barrel-shaped, and the lower part of

the sternum is much depressed—a modified "trichter-brust." On the first day nothing was noticed on the examination of the lungs. The heart sounds were clear; second aortic accentuated and ringing.

Note on the abdomen reads: "Soft, irregularly distended, the intestinal peristalsis can be seen through the thin walls; no tenderness; no growth felt. Percussion limits of the spleen and liver are normal." The patient was thought to have a senile cachexia, and was ordered stimulants, with iron and nourishing food. The urine contained a moderate amount of albumin with granular and hyaline casts. During the 23rd, 24th and 25th there was fever, the temperature rising to 101°. It was usually normal, sometimes subnormal, in the morning. There was no diarrhœa. Had no cough, no expectoration. The physical examination was negative. On the 27th he began to have diarrhœa. He was unconscious; tongue very dry; he passed the urine and fæces involuntarily. The ecchymoses on the chest were more extensive. To-day it was found that the percussion note at the left base was dull as high as the angle of the scapula. Respiration was tubular, expiration prolonged, and there were a few râles. It was then thought that it was a case of pneumonia in an old debilitated individual. He became progressively weaker on the 28th and died on the morning of the 29th. The diagnosis was pneumonia in an old man.

Autopsy (Dr. Welch). Anatomical diagnosis: *Typhoid fever. Recent croupous pneumonia of the left lower lobe, enlarged spleen, gall stones.*

Peritoneum smooth; the peritoneal surface of the ileum near the valve was covered with streaks of dark-red hemorrhagic infiltration. The small intestine presented a number of ulcers, the largest were in the lower part of the ileum. They were irregular, nearly always as deep as the transverse muscular coat, and with little or no thickening, and without adherent sloughs. Many had dark-red hemorrhagic floors. One occcupied the margin of the ileo-cæcal valve. They extended upwards for a distance of 50 cm. There were also many small follicular ulcers. The edges of the ulcers were but little undermined. In the cæcum and beginning of the colon were several small ulcers; glands moderately swollen, soft. There was no trace of tubercles over the ulcers, which were undoubtedly typhoid in character.

Spleen was soft and weighing 260 grammes. The heart was small; valves presented calcareous plates.

The lobe of left lung was in a condition of recent hepatization, the remainder of the lung emphysematous. There was much œdema. Kidneys were anæmic and were in a state of cloudy swelling.

This interesting case of typhoid in an aged man presented no clinical features in any way characteristic. He was admitted in a cachectic condition with dry, furred tongue, and when the consolidation in the left lower lobe was detected, Dr. Lafleur, under whose care he came, thought very naturally that it was an instance of slowly developing pneumonia in an old man, that the "typhoid state," so well marked, was secondary. With this opinion, I, seeing him two two days before death, concurred. Unfortunately, no details could be obtained as to the length of time the patient had been ill. It is interesting to note the low temperatures. On four or five occasions within the first three days he was in hospital the temperature was below 98°, and once was 97.5°. In the week he was under observation only once did the temperature rise above 102°. The extensive cutaneous hemorrhages were such as are seen frequently in the protracted cachexia of elderly people.

CASE XVI. *Admission in second week. Pregnancy, high fever, delirium in third week, with increase of fever; diarrhœa; œdema of glottis, tracheotomy; death, autopsy.*

Annie M., aged 23 (Hos. No. 4559), admitted January 1, 1892. Patient was transferred to the medical side from the gynecological ward, to which she had been admitted the day before, complaining of fever and malaise. She had been a healthy woman; married at 18, had had one child. Present illness began five days ago. She had previously felt well. Her husband had recently had an attack of typhoid fever, with relapse. She has been feverish for nearly a week. Healthy looking, well nourished woman. Signs of old interstitial keratitis, and the central incisor teeth are notched. Temperature 105°, pulse 120. Tongue dry and brown. The abdomen is evenly distended. The uterus can be felt in the position of about the fifth month of pregnancy. There are typical rose spots on the abdomen and thorax. The spleen is just palpable, heart sounds are fairly loud, the first is accompanied by a soft, blowing murmur.

The urine contained no albumin. For the first week in hospital she had no special features except the persistent high fever, which was not much controlled by the baths. She was rational. The pulse ranged from 104 to 112; she had no diarrhœa. After the 19th she did not take the baths well, and considering her condition, it was thought well to substitute the sponging for them. During the second week in hospital the temperature was lower, only occasionally reaching 104°. The pulse, however, was feeble and she had emaciated very much. She took stimulants and food freely.

On January 30th the temperature sank to and remained at 100° for 16 hours, and on the 31st it fell to 98°. She was quite rational and took her food better. During the third week in hospital she became worse; the temperature kept persistently high, between 104° and 104.5°. She had no diarrhœa. In the fourth week the fever persisted and she began to have for the first time delirium. There had been no distension of the abdomen, no diarrhœa. The rose spots, of which there had been several crops, had almost disappeared. The fœtal movements were distinctly felt. On February 16th there was a fresh crop of rose spots noted. The temperature kept persistently high, constantly reaching 104.5° and rarely sinking to 101°. The pulse ranged from 130 to 140. On February 22nd she seemed to be somewhat better and temperature had been falling. For a few days she had been much troubled with hoarseness, and with diarrhœa. On the 22nd, 23rd and 24th the temperature was between 100° and 100.5°. On the morning of the 24th the patient became very hoarse and could scarcely speak above a whisper. By noon there was very marked difficulty in breathing. It was very difficult to make a thorough examination of the larynx, but there seemed to be a considerable degree of œdema about the epiglottis. At 8 o'clock that evening Dr. Halsted performed tracheotomy, with temporary relief, but during the night she sank rapidly, and died on the 50th day of her illness.

Throughout the attack the urine contained a trace of albumin with hyaline and granular casts.

Autopsy. Anatomical diagnosis: *Typhoid fever. Ulcers healing and others in progress, broncho-pneumonia, pregnancy at sixth month (cerebral hemorrhage of fœtus, general œdema of fœtus).*

Extensive ulceration in the ileum. The larger ulcers had circular outlines, but with low, not very well-defined edges. There was a

very large ulcerated surface near the valve. Higher up in the intestine there were ulcers which had almost healed, and in places there were completely healed ulcers and fresh ulceration in close contact. The mesenteric glands were greatly enlarged. Spleen enlarged, weighed 250 grammes. The kidneys were pale; there were numerous small areas on the surface, made up of small reddish bodies surrounded by areas of hyperæmia, which were found to be abscesses containing the typhoid bacilli. The heart was pale, the muscle fibre very flaccid and showed diffuse and fine fatty degeneration.

Marked œdema and congestion at the bases of both lungs, with small areas of broncho-pneumonia.

This unusually protracted case presented two periods; from the 28th to the 31st day there was a break and the temperature was not so high, and she seemed to be improving; subsequently the fever rose again, and on the 8th and 9th there was a fresh crop of rose spots.

Œdema of the glottis is a rare complication of typhoid fever. In the exhaustive article by Lüning,* of 115 autopsies in which there were serious laryngeal complications, in 9 œdema was present. In only 6 cases the condition was uncomplicated.

III.—Accidents of the Lesion.

Hemorrhage.—Of the 229 cases, eight had hemorrhage from the bowels, three of which proved fatal. In the first instance, an elderly man, admitted on the 10th day of his illness, had a sharp attack, with severe diarrhœa and high fever in the fourth week; death followed shortly after a very profuse hemorrhage from the bowels. In the second case, a young man who had been ill for at least two or three weeks before admission to hospital, had a large hemorrhage the day after his admission, and died within twelve hours. In the third case (Hos. No. 6410), there was perforation, and it is given in that section.

Case VIII. *Admission on 10th day, with diarrhœa, occasional vomiting, persistence of fever in 4th week, profuse hemorrhage from the bowels, death, no autopsy.*

*Die Laryngo- und Tracheostenosen im Verlaufe des Abdominaltyphus, *Archiv für klin. Chirurgie*, Band XXXI.

Charles B. L., aged 51 (Hos. No. 1450), admitted July 7, 1890, about the 10th day of an illness, in which he had had diarrhœa, fever, cough, and several chills. He had also had at the onset very obstinate vomiting. During the second and third weeks the temperature ranged from 100° to 103°. The tongue was not dry, the pulse was of fair volume, and the general condition was good. He had no bad symptoms except that the stomach remained a little irritable and he had an occasional attack of vomiting. No rash was noted. In the fourth week the fever did not abate, the pulse became more rapid and feeble, and he had diarrhœa, from five to eight stools daily; on the 15th the tongue became dry and coated, and nervous symptoms were marked. On the 16th he had a graduated tepid bath. On the 16th his temperature rose to 104° and he had another bath at 80° F. On the morning of the 17th, following a profuse hemorrhage from the bowels, he became collapsed, and in spite of stimulation and hypodermics of ether, he did not rally, and died the same evening.

There was no autopsy.

Case XV. *Admission in third week. High fever, rapid pulse, meteorism. On second day severe hemorrhage, recurrence on third day, death, autopsy.*

Patrick W., colored, aged 23, laborer (Hos. No. 4192), admitted November 7th, 1892, complaining of diarrhœa. Had been a very healthy man. The present illness began three weeks ago, with diarrhœa, six or seven stools a day. He had had chilly feelings and pain in the back. He had not been able to work for the past twenty-five days. He was told that he had a high fever and two weeks ago he was delirious. He has had also a slight cough. When admitted the pulse was extremely weak and rapid. The temperature was 103.5°; tongue was heavily coated. The abdomen was distended and tender; the spleen was enlarged, readily palpable; the blood examination was negative, and there was no leucocytosis. He was bathed, and the baths acted very promptly, reducing the temperature from three to four degrees. On the 8th the temperature was between 104° and 105°; the pulse extremely rapid, between 130 and 150. The heart sounds were feeble, but clear. Abdomen was tense and tender on pressure; slight trace of albumin in the urine. At 9 p. m. he had a large hemorrhage from the bowels, passing

many clots, and all night there was more or less oozing. On the morning of the 9th he looked a little blanched, but was sleeping quietly. The pulse was 142, very weak and irregular. In spite of the large hemorrhage the temperature was not at all reduced; thus at 8 p. m. it was 103.2°, at 10 p. m. the same, and throughout the night it ranged between 101.5° and 102.5°. The patient sank rapidly through the day, and died at nine on the evening of the 9th, about 48 hours after admission, and on or about the 28th day of the disease.

Autopsy. Anatomical diagnosis: *Typhoid ulceration of the ileum, acute broncho-pneumonia.*

Peritoneum smooth. There was no special distension of the intestines. In the ileum there were well-defined ulcers with sharp edges and numerous swollen solitary and agminate glands. Some of the latter had greatly elevated edges with well-marked reticular appearance. The solitary glands were in all stages of swelling, and they showed superficial necrosis at the apices. The large intestine showed the most extensive ulceration. There were well-marked typical ulcers with clean bases. There were other elevations over the surface with areas of necrosis. The ulcerations in the large bowel looked old and there was some slaty discoloration in the mucous membrane about them. The source of the bleeding was not discovered. The glands of the mesentery were greatly enlarged. The heart was pale, the valves normal. The muscle showed slight fatty degeneration. The lungs showed at the bases a few areas of broncho-pneumonia. The brain and cord showed no changes.

PERFORATION.—Peritonitis from perforation of the bowel was responsible for eight deaths, a percentage of 36.4 of the fatal cases, and of 3.5 of the total number admitted, a high percentage in comparison with that of Munich, in which of 2000 fatal cases there were 114 deaths from this cause, 5.7 per cent. Of the 64 post-mortems of which I have notes, there were 15 deaths from this cause, 23.4 per cent. Of the eight cases, the ileum was perforated in four, the appendix vermiformis in two, and the colon in two. The high percentage of perforation is rather remarkable. The averages as given in the large statistics from the Hamburg hospital and the statistics of Liebermeister were only about 1.2 and 1.3 per cent. The percentage given by Murchison in his collected cases was, however, as high as eleven.

The time of the occurrence of the perforation in these eight cases was as follows: in the 8th week, 1; in the 7th week, 2; in the 5th week, 1; in the 4th week, 2; at end of second week, 2.

In every one of the cases, as may be gathered from the notes, the attack was severe, and in more than one-half of them protracted. In six cases the symptoms of perforation were present—pain, increasing abdominal distension, and collapse. In one case (XXI) the abdomen was retracted. In two cases the condition was unsuspected, though in one (case IX), in which the appendix was perforated, there was great pain in the right iliac fossa.

Perforation of the appendix in typhoid fever is not very common, 3 per cent in the 167 cases of perforated bowel collected by Fitz, who remarks:* "Clinical evidence, on the contrary, though perhaps misunderstood, is abundant as to the probable frequency of perforative appendicitis in typhoid fever. The probability of its occurrence furnishes the best solution as to the prognosis of intestinal perforation in the latter disease. Most of the cases of recovery from symptoms of perforation of the bowel in typhoid fever are those in which an attack of appendicitis is closely simulated, while the fatal cases of perforation of the bowel in typhoid fever are, in a great majority of instances, those in which other parts of the bowel than the appendix are the seat of the perforation; hence the prognosis of apparent perforation of the bowel in typhoid fever is to be regarded as the more favorable the more closely the symptoms and course resemble those of an appendicitis."

CASE IV. *Admission in third week. Hemorrhage from bowels, progressive asthenia, perforation, death, autopsy.*

Zachariah L., aged 40 (Hosp. No. 319), admitted September 27, 1889. The patient applied at the surgical dispensary, and while waiting became very weak, and had a large bloody stool. When taken to the ward he was extremely feeble, and stated that he was a sailor by occupation, and had not worked for three weeks on account of fever and diarrhœa. No further history could be obtained. Temperature on admission was 101°; pulse 92, dicrotic; tongue was furred, not dry; the abdomen soft, with a few suspicious-looking spots. The heart sounds were very feeble, the first particularly weak, and there was a systolic murmur at left border of sternum. He had no further

* Transactions of the Association of American Physicians, vol. vi., p. 209.

bleeding through the day, and was given stimulants, and for two days a mixture of ergot, turpentine and laudanum. During the next four days he became progressively weaker; there was continuous delirium; the temperature range was not high, but he was persistently drowsy. On the 30th the temperature fell to 98°. Throughout the first two weeks in October he was very feeble, with persistent delirium and rapid pulse. He had no diarrhœa. The tongue was extremely dry. On the 17th the pulse became much more rapid, and he had marked tremor of the extremities. The temperature range was irregular, between 100° and 103°. During the last week he was extremely feeble, the temperature showed very slight variations; thus from the 15th to the 18th it was between 102° and 103.5°, occasionally rising to 104°. On the 19th, 20th and 21st it was between 100° and 102°, and fell quite gradually and on the 22d, when he died, it was 98°. Towards the close there was no diarrhœa and no special abdominal symptoms. The heart sounds were extremely feeble, and the pulse rapid, 140.

Autopsy (Dr. Councilman). Anatomical diagnosis: *Typhoid ulcers in ileum and colon, perforation of ileum* 150 *cm. above valve, peritonitis, bronchitis, œdema of the lungs, broncho-pneumonia, pleuritis.*

About 75 cc. of yellow, turbid fluid in the peritoneum. The coils of the intestines agglutinated by fresh exudate; no gas escaped on opening the peritoneum. In lower part of ileum there were extensive irregular ulcers with smooth clean floors, showing the muscular layers. The edges were thickened and showed medullary infiltration. Many of the ulcers were placed transversely. The highest ulcer, 150 cm. from the valve, measured 2 cm. in transverse diameter and 3 cm. in length. In its centre was a yellowish slough 4 mm. in diameter, extending through the wall of the gut. At the edge of the slough there was a pin-hole perforation.

There were several oval ulcers in the cæcum and colon. The lungs showed intense general œdema; a patch of consolidation in the right lower lobe, with an acute fibrinous pleurisy. The heart muscle was brownish-red in color and distinctly flabby. The spleen weighed 295 grammes.

CASE VI. *Admission in beginning of second week. Perforation, collapse symptoms, peritonitis, death, autopsy.*

Eliza M., aged 18, Swiss (Hosp. No. 926), admitted March 5, 1890. She had only recently come to this country; had been ill for

a week with pain in the head and back, cough and fever. It is difficult to say exactly how long she has been ill, but she says for not more than a week. She had complained of a good deal of abdominal pain, and as there was disturbance of menstruation she was admitted to the gynecological ward. When transferred to us, the temperature was 103.5°; the abdomen was full, tense, and tender on pressure; pulse 120. The abdominal distension was so great, with a tympany extending to the fifth space on the right side and obliterating the liver dulness, that Dr. Lafleur thought that possibly perforation had occurred. On the 6th at 10.30 a. m. she had a chill lasting a half hour; complained of very severe abdominal pain. The temperature was 101.5°, and only rose by 1 o'clock to 103.5°. The note by Dr. Lafleur on the 6th was as follows: "Complains of severe abdominal pain; respirations 48, shallow; expiration groaning; pulse 168, compressible; skin hot and dry; face slightly flushed, not anxious-looking; tongue moist, with a brownish fur; pupils equal. Lungs present a few moist râles at the base. The heart sounds are fœtal in character, very rapid, possibly a soft systolic murmur at the apex. The abdomen is uniformly distended, rigid, very sensitive in right iliac and lumbar regions; bowel tympany extends to fifth interspace, and in the nipple line the liver dulness occupies only three-fourths of an inch. The spleen is not palpable. Rose spots present on back." The evening temperature on the 6th rose to 103.5°. Throughout the morning of the 7th the temperature fell and was 98° at 12.30 a. m., then gradually rose through the morning. At the visit the patient was sweating profusely, looked collapsed; face pale, hands bluish; pulse 170, thready and very compressible; respiration shallow, rapid; mind perfectly clear. The liver dulness was practically obliterated. The temperature between 10 a. m. and 7.30 p. m. ranged from 104° to 105°. Throughout the early morning of the 8th it fell and at 2.45 a. m. was 96.5°. It rose at 5 a. m. to 103° and fell again at 6 a. m. to 96°. At 8 a. m. it rose to 104°. The patient on the 8th was somewhat cyanotic, with cold extremities. The temperature, however, kept up and was between 104° and 105°. The heart sounds were fœtal in character and extremely rapid. On the morning of the 9th the temperature rose to 106° and she died at 12.45.

Autopsy. Anatomical diagnosis: *Typhoid ulcers in the ileum and cæcum, perforation of ileum in three of the ulcers. General purulent peritonitis. Sacculated peritonitis between the liver and diaphragm.*

Escape of gas on opening the peritoneum; membrane covered with thick, whitish-yellow granular material. The edge of the right lobe of the liver united to abdominal wall. There was a cavity between the right lobe and the diaphragm lined with soft white membrane, tolerably tough and easily removed. This cavity contained air, and the same yellowish matter as in the abdominal cavity. The coils of intestines were matted together. On separating them perforations were seen. The diaphragm on the right side corresponded to the lower margin of the third rib; on the left side to the lower border of the fourth rib.

The ileum presented numerous ulcers with sharp, clear-cut edges. Many of them were deep. Three of the ulcers presented perforations; the first, 60 cm. above the ileo-cæcal valve; the second, 20 cm. above this, and another about the same distance higher. The mesenteric glands were very large and soft. The spleen weighed 156 grammes. The heart was normal; no fatty degeneration of the muscle fibres.

CASE IX. *Admission in third week. Diarrhœa, high fever, pain in right iliac fossa, peritonitis, death, autopsy.*

Caroline M., aged 40 (Hos. No. 1540), admitted July 24th, 1890. Patient is a Swede; has been in this country six years; has been usually very healthy and strong. Her present illness began on July 8th, with diarrhœa and vomiting. The stools were very frequent and she vomited two or three times a day. She had headache, pain in the abdomen and slight cough. The expectoration, she said, was, several times, blood-tinged. All these symptoms have persisted until the present, except the vomiting, which stopped three days ago. She has from six to eight stools a day, watery, and without any pain. On admission the temperature was 101°, rose to 105° at 10 p. m. The pulse was 108, irregular in volume and intermittent. Tongue thickly coated. The baths which the patient had systematically every three hours when the temperature rose above 102.5°, were taken pretty well, though followed by a good deal of chattering of the teeth and cyanosis. On the 28th there were a few doubtful rose spots. The diarrhœa persisted. The temperature range throughout the first week in hospital tended constantly towards 104°. Pulse was from 116 to 132. August 3d, pulse 144, very dicrotic, fairly good volume, cheeks flushed, hands

and feet slightly cold, tongue dry and hard. Sensorium very slightly clouded. At the base of the right lung there is modified dulness; breathing is slightly tubular. Abdomen distended, not painful. Heart sounds are clear and rapid. Patient passed stools involuntarily in the night. To-day she was so feeble that the baths were not given. They were resumed on the 4th. On the 5th she was extremely restless; pulse small and rapid; mind clear. Respiration 30; tongue dry and brown; abdomen soft, not distended, but is tender on pressure in the right iliac fossa; the spleen is not palpable. Temperature in the evening rose rapidly to 106°, and she died at midnight.

The patient had 29 baths.

Autopsy. Anatomical diagnosis: *Typhoid ulceration of ileum; perforation of vermiform appendix; acute peritonitis.*

On opening the abdominal cavity there was an escape of gas. Large intestines much dilated; peritoneum covered with purulent exudate; 200 cc. of cloudy purulent fluid. Diaphragm on the right side at lower margin of third rib.

The ileum presented numerous ulcers in the Peyer's patches; the bases were clean. Some of the upper ones had small bile-stained sloughs adherent; swelling of the solitary follicles. The ulceration was very extensive about the valve. The vermiform appendix was dilated, and presented numerous ulcers with necrotic sloughs. Two of these ulcers had perforated, making openings, one 5 mm., the other 4 mm. in diameter. The large intestine presented many ulcers with smooth bases.

The spleen weighed 230 grammes. Heart muscle soft and pale, easily torn, showed very slight fatty degeneration. Lungs intensely congested at bases; in the superior division of the left pulmonary artery was a soft thrombus. The kidneys were enlarged and soft, and showed fatty degeneration.

CASE XIII. *Admission at beginning of second week. Moderate fever, delirium, meteorism, collapse symptoms, peritonitis, death, autopsy.*

Matthias G., aged 26, German (Hos. No. 3732), admitted August 28th, 1891. Patient had been in this country only nine months. Had always been well until the present illness, which began eight days ago with loss of appetite, vomiting, fever and chilly sensations. On August 24th he took medicine to move the bowels.

Patient is a large, well-built man; temperature 102°; pulse 88, dicrotic. There is a diffuse erythematous rash over the chest and abdomen. The fauces are red and œdematous. For the first week in hospital the patient did very well. He took the baths nicely, and they had a marked influence in reducing the temperature, often four or five degrees. During the second week in hospital he was not so well; pulse became more rapid, above 108. On September 5th the note was: "Rash very distinct on abdomen; spleen palpable, below ribs; tongue is dry and brown; mind is quite clear. Range of temperature is now between 99° and 103°." About Sept. 9th the patient for the first time became delirious and very restless. The temperature, however, was not high, and on the 9th he only had three baths in the 24 hours. They had a very pronounced influence; thus a bath of 20 minutes at 70° at 4 a. m. on the morning of the 9th reduced the temperature to 96°, and at about 6 a. m. it had only risen to 97° and at 8 a. m. to 98°. The pulse became more rapid. It was noticed this morning for the first time that the abdomen was uniformly distended, rather firm, tympanitic, but not sensitive. The patient lay, however, with the knees somewhat drawn up. The pulse did not show any marked change, and throughout the 9th the temperature rose and in the evening was 104°. Early on the morning of the 10th the patient was in profound collapse, the temperature at 97°. He had not had a bath. He had passed a restless night and had been very delirious. Abdomen was distended, tense, tympanitic, and tender on pressure. It was suspected that perforation had taken place. The temperature rose through the day and by 8 p. m. had reached nearly 104°. He died on the night of the 10th. The urine in this case very shortly after the onset contained albumin, with a few hyaline casts, and latterly the amount of albumin had distinctly increased.

Autopsy. Anatomical diagnosis: *Typhoid fever, perforation, peritonitis, ulceration of epiglottis.*

Peritoneum contained gas; the membrane was injected, cloudy and covered with fibrinous exudate. There were 200 cc. of turbid yellowish fluid in the cavity. There were many ulcers, the largest and most advanced just at the valve. Mucous membrane swollen; the edges of the ulcers were undermined, the bases formed by the muscular coat. On a few of the ulcers necrotic tissue was still adherent. Twenty-two centimetres from the valve was a deep ulcer 2 cm.

in diameter, in the centre of which was a round perforation 2 mm. No ulcers in the large intestine. The spleen was enlarged and weighed 510 grammes.

Intense congestion of lower lobes of both lungs. The entire upper edge of the epiglottis was ulcerated and covered with a dark brown, easily separated fibrinous mass. There was slight necrosis in areas on the posterior wall of the pharynx. The heart was pale and soft, the muscle not fatty.

CASE XIX. *Admission in second week. In fifth week of illness great abdominal pain, vomiting, no pain or meteorism, emaciation; and in seventh week pain in abdomen, no swelling, vomiting, diarrhœa, death, autopsy.*

Benthine L., aged 21, domestic (Hos. No. 5597), admitted July 22nd, 1892. Patient had been a healthy girl. Present illness began about a week ago with loss of appetite and chilly feelings and fever. On admission the temperature was 104.5°; pulse 118. Abdomen was not distended, but tense. There was a slight erythematous blush over the lower thoracic and upper abdominal regions. The spleen could not be felt. Examination of the heart and lungs negative. Urine contained a trace of albumin, and there was distinct diazo reaction. During the first week the temperature range was between 100° (after a bath) and 105.8°. The baths reduced the temperature an average of three degrees. There had been a characteristic rose rash and the spleen could be distinctly felt. During the second week in hospital the fever kept high; the baths had a very marked influence, often reducing the temperature five and on one occasion six degrees. The pulse was feeble and rapid, from 116 to 120. The tongue was dry and coated. There had been no abdominal distension or tenderness, and only lately a little tendency to diarrhœa. In the third week the temperature was on the whole somewhat lower, though it often rose to 104° and once to 105°. She took the baths well and they still had a very marked influence on the fever. The rose spots disappeared. The pulse had been somewhat better. She had had troublesome boils on the back. There was no delirium. During the fourth week in hospital the temperature was not so high, and between August 13th and 17th it was usually between 101° and 102°, and she seemed to be doing well. On August 18th, after a bath the temperature fell from 105.8° to 99.2°. The pulse rose above 140, and

the patient complained of great abdominal pain, and was in an extremely weak condition, so that hypodermics of ether had to be given. The temperature, notwithstanding the sponging, rose and between 2 and 10 p. m. remained above 104°, and from that time until 2 a. m. it fell and reached 101°. For the first time on the 17th she vomited greenish fluid. Since then she has vomited a number of times and complains of abdominal pain on any movement. On the 19th the patient was better; the pulse was only 104, and of better quality. The abdomen was not tender. During the next week, the fifth, the vomiting was a troublesome symptom, and she was somewhat nervous and excited. The temperature on August 21st rose to 105.5°, but after sponging sank and the next morning was 98°. The abdomen had been retracted, tense, and very tender to the touch. Patient was now markedly emaciated, the features drawn, the pupils dilated. From this time until the 30th the temperature was extremely irregular, each day rising to between 103° and 104°, and then falling, sometimes to normal or even becoming subnormal. On the 30th the special tenderness and pain in the abdomen was noticed, but there was no distension. She was, however, extremely feeble, and the vomiting had been severe. On the 31st, note stated that the general condition had not improved; emaciation had increased. There was less vomiting; the pulse was extremely small and rapid, and could scarcely be counted at the wrist. Patient had five involuntary movements during the night. On the 31st the temperature did not rise above 100.5°; she became feebler and died on September 1st.

Autopsy. Anatomical diagnosis: *Late stage of typhoid fever, ulcers in small intestine, perforating ulcer in sigmoid flexure, general peritonitis.*

Peritoneum covered with flakes of lymph; little or no fluid present. On the sigmoid flexure there was a more circumscribed peritonitis, with a distinctly purulent exudate; corresponding to this there is a perforation of the bowel 2 mm. in diameter.

Peyer's patches were more prominent than normal, presenting small losses of substance. Occupying sometimes the middle of the patch could be seen two or more ulcers, which reached no deeper than the muscle. The edges were smooth. In the lower part of the ileum the patches were more prominent. The ulcers here sometimes were at right angles to the gut, and some of them had undermined

edges with clean bases, exposing the transverse muscle fibres. In the large intestine there were no ulcers, nor were the follicles at all swollen until the descending colon was reached. Here the solitary follicles were prominent and showed superficial losses of substance. At one of these points perforation had occurred. The ulcer had clean-cut edges and the perforation was 2 mm. in diameter. Another ulcer occurred in the sigmoid flexure. In the rectum there was a large irregular ulceration just above the anus, 3x3.5 cm. in size.

The mesenteric glands were swollen and enlarged; the spleen was not much enlarged.

CASE XX. *Admission about end of first week. Moderate fever, rapid and feeble pulse. End of second week, abdominal distension and pain; death, autopsy.*

Henry A., aged 35 (Hos. No. 6231), admitted November 1st, 1892. Present illness began about a week ago with pain in the back of the neck, general stiffness and soreness. Worked until five days ago. Four days ago felt very dizzy and had pains all over, and has felt hot. Has been in bed for five days. When admitted the temperature was 104°, the pulse 120, respirations 32. The tongue was dry and coated; there was a well-marked rash on the skin of the abdomen, and the spleen was palpable. The fever persisted, not much influenced by the baths, only occasionally there was a drop of more than two degrees. The patient seemed to do well, took his food satisfactorily; the pulse was sometimes rapid and feeble, 120 to 126. He was perfectly rational. The abdomen was tender and not specially distended. On the 8th the note was, "temperature from 4th to 8th has ranged from 100.6° to 104.2°. The temperature of the baths was reduced to 65°. The drops in fever after bathing have not been at all marked. The pulse has been feeble and rapid, and the patient has been given stimulants freely and strychnia." It was noted to-day that there is some tenderness over the abdomen. In the evening the abdomen was found considerably distended, particularly in the epigastric region just below the ensiform cartilage. The bowel-tympany reached high and completely obliterated the liver dulness. The patient sank and died at 11 p. m. on the 8th.

I noted as follows: "When I saw this man at 12 noon there were no marked collapse symptoms; the pulse was rapid, but not small; face not pinched or anxious-looking, and he answered ques-

tions readily. There was pain in the lower abdomen; the tympany was higher in the thorax than I have ever found it."

Autopsy. Anatomical diagnosis: *Typhoid (early and late) ulcers, perforation of ileum with diffuse peritonitis.*

1000 cc. of turbid fluid in peritoneal cavity; fibrinous exudate over the coils of intestine. In the ileum, Peyer's patches were prominent. At a distance of 8 cm. above the valve was an ulceration 5 by 12 mm., which passed through all the coats, perforating the serous layer. The mucosa was undermined. From this point downwards the solitary follicles were swollen throughout, and some presented small ulcerations. In the large intestine the follicles were not swollen. The spleen weighed 750 grammes. The kidneys were a little pale, but of good consistency. The heart muscle was brownish-red in color and looked healthy. The lungs showed no special changes.

CASE XXI. *Admission in fourth week. Mass in right iliac fossa, great debility, signs of perforation, peritonitis, death.*

Ferdinand W., aged 18 (Hos. No. 6333), admitted Nov. 15th, 1892. Patient had been a healthy man. Present illness began five weeks ago with headache, which has been a prominent symptom. He has been in bed three weeks with fever and loss of appetite. Within the past few days he has had diarrhœa. During the first two weeks he had epistaxis five or six times. On admission the temperature was 105°, rose in the evening to 106°. The patient looked well and was not emaciated; temperature at the morning examination was 101°. Pulse 120, small in volume, not dicrotic. Tongue swollen, a little furred. There was no delirium. A few suspicious-looking spots on the abdomen. In the right iliac fossa, midway between the navel and the anterior superior spine, there was a definite rounded mass about the size of a walnut, soft and elastic, and not sensitive on pressure. There was resonance over it. The spleen was not palpable; heart sounds were clear. During the first week the fever was persistently high, but was influenced rapidly by the baths, the reduction being from 4 to 5 degrees. Towards the end of the first week in hospital he became very much feebler. A crop of well-defined spots came out. He had involuntary movements; there were no changes in the mass in the right iliac fossa; the tongue was somewhat dry and fissured. On the 24th the note is as follows: "Patient

is lying on his left side with his hand on the abdomen, groaning continually. The abdomen is retracted and very tense, and is painful on pressure, but after examination considerable pressure is borne without much increase in the pain. Pulse is 120, full, but of low tension; tongue is dry, brown, glazed. Yesterday he had six stools, fluid, yellowish, and contained no blood. There is no leucocytosis. On the evening of the 24th the temperature rose to nearly 107°." On the 26th the note is, "temperature remains elevated; the diarrhœa, which was better, has recurred. The abdomen is retracted and tender; the pulse is small and soft; face is pinched. The temperature rose to 106° at noon." He gradually sank and died in the afternoon of the 26th.

Autopsy. Anatomical diagnosis: *Typhoid fever, perforation of appendix vermiformis, fibrino-purulent peritonitis, chronic diffuse nephritis, gas bacillus in the blood.*

In the lower half of the peritoneum there was an extensive fibrino-purulent exudate. In the right iliac fossa there was some brownish-yellow fluid with distinctly fæcal odor. The vermiform appendix was 6 cm. long and buried in a mass of lymph. On examination a pin-hole perforation was found near its attachment to the cæcum, from which gas and fluid escaped on pressure.

Small intestine was apparently normal until the middle of the ileum is reached, at which point there was a single enlarged follicle. Peyer's patches were not swollen until 35 cm. above the valve. The swelling was slight in amount, the edges a little elevated. The first ulcer was 20 cm. above the valve, in a patch. Other ulcers with sloughing contents occurred just above the valve. The cæcum presented many ulcers varying in size, some with sloughs attached, others with clean bases. Many ulcers existed throughout the ascending and transverse colon. In the rectum there was an ulcer 3 mm. in extent. The appendix vermiformis presented two ulcers corresponding to the perforations mentioned. The mesenteric glands were enlarged; the spleen weighed 210 grammes.

The kidneys weighed 260 grammes together; the capsules adherent, and microscopically the organ showed a chronic diffuse nephritis. The heart muscle was pale. The lungs were congested and œdematous at the bases.

CASE XXII. *Admission in end of first week Mild attack at first, in third week high fever and delirium, in sixth week much delirium and*

great debility, pain in right iliac fossa, hiccough, abdomen not distended, death, autopsy.

Ferdinand B., aged 44 (Hos. No. 6410), admitted December 12, 1892. Patient is a German; had been in America one year. Had always been healthy and strong. Present illness began six weeks ago with cough and pain in the chest. He kept at work, however, until four days ago, when he gave up on account of weakness and headache. On admission the temperature was 99°, rose in the evening to 103.5°.

Large framed, well-nourished man; pulse 96, regular in force and rhythm; respirations wheezing in character, and there are sibilant râles heard everywhere. The heart sounds are clear. The abdomen is full, but not tender. The spleen is not palpable. Patient has a good deal of cough. The temperature for the first week in hospital was not high, usually reaching every day 102° and sinking to 98° or 99°; thus on the 14th, 15th and 16th of December the temperature range was between 99° and 101°. His cough was better and the râles disappeared. The pulse was not above 100; he had no diarrhœa. About the ninth day there were well-marked rose spots, and it was regarded as a case of moderate intensity. During the second week in hospital the temperature rose; thus, on the 17th it reached 103°, and the baths were begun. Throughout the third week the temperature kept up and was constantly in the neighborhood of 104°. He took the baths well, but he now had the appearance of a patient severely ill. He was delirious, and the pulse was rapid, 116, and of low tension. On the 26th he became so feeble that the baths were omitted. He had constant delirium and a good deal of tremor. He had on this day a slight hemorrhage. The abdomen was not specially tense. The fever persisted and he improved somewhat, so that the baths were resumed on the 28th. The temperature throughout the fourth week was lower, ranging from 101° to 103.5°. He remained in very much the same condition throughout the fifth week. He had moderate diarrhœa, which was generally controlled with a pill of lead and opium. In the sixth week the temperature became more irregular, and frequently there were drops nearly to normal. The patient still had a wandering delirium and there was some subsultus. On January 30 the note is: "The diarrhœa has continued without much change, and patient has been very excited, nervous and delirious, and has struggled vio-

lently against the baths and the enemata. Last night he complained much of pain and referred it to the right iliac fossa. The pulse, which had before ranged from 100 to 128, rose at 7 a. m. to 160, and at 8 o'clock to 168. At the visit he was in a soporose condition, the mouth open; pulse 164, small in volume and low in tension. The hands and the mucous membranes were cyanotic. The patient was evidently very much weaker. The abdomen was full, but not distended. Patient complained of tenderness in the right iliac fossa. The hepatic flatness reached from the sixth rib to the costal margin. The pain came on suddenly during the night, and ever since the patient has lain with the legs drawn up. He has also had hiccough this morning." Patient became much worse in the afternoon; pulse rapid; no increase in the distension of the abdomen. The liver dulness remained as noted above, and he died at 1 p. m. The temperature throughout the 11th, 12th, 13th and 14th was intermittent, the evening ranging generally from 102.5° to 103°, and the morning almost to normal. Throughout the 15th the temperature was between 99° and 100° for 24 hours, and on the 16th, 17th and 18th there was very slight elevation.

Autopsy (Dr. Barker). Anatomical diagnosis: *Extensive typhoid ulceration in small and large intestines, healing ulcers in small bowel, advancing ulcers in colon, ulceration extending on to skin at anus and into vesico-rectal tissue, perforation of ulcer in colon, general purulent peritonitis, ulceration of pharynx.*

On opening the peritoneal cavity a foul-smelling gas escaped. The membrane was covered by a thick yellow exudate. There were 300 cc. of purulent fluid in pelvis. There were many hemorrhages in the subperitoneal tissue.

No ulceration in the jejunum; the first ulcer occurred 120 cm. above the valve and was in process of cicatrization. 17 cm. below this there was a second ulcer with more advanced healing; 12 cm. lower down there was a large ulcer with a clean base and undermined edges. Beginning 145 cm. above the valve there were very large losses of substance, consisting of irregular circular areas of ulceration with perfectly clean bases. Just above the valve there was a large irregular ulcer 5 by 12 cm. The appendix was normal. The cæcum showed superficial losses of substance, and the solitary follicles were swollen. The largest and most numerous ulcers were in the sigmoid flexure and rectum. The first, 12 by 5 cm., was in the lower part of

the colon and extended into the rectum, its lower end being 8 cm. from the anus. The base of this was quite clean, and the muscular coat everywhere exposed. In three or four places the erosion extended nearly to the serosa, and in the central part there was a perforation 1 mm. in diameter. Just before the lower end of this ulcer was reached there was an irregular excavation leading into the cellular tissue between the rectum and the base of the bladder. The tissue here had a dark sloughy appearance, but there was no pus. At the anus and extending on the skin for a distance of 1.5 cm. in the case of one, and just impinging in the case of the other, were two ulcers with pigmented edges.

There was an irregular ulceration in the posterior wall of the pharynx, 2 cm. by 5 cm., which led directly into the submucous tissue. The spleen weighed 210 grammes and was soft. The kidneys were swollen, the substance coarse, and the striæ very marked.

The heart substance was moderately firm, brownish in color. The intima of the aorta was fatty. The lungs were voluminous, congested and œdematous at the bases.

IV.—NOTES ON SPECIAL FEATURES, SYMPTOMS AND COMPLICATIONS.

BY WILLIAM OSLER, M. D.

1.—Analysis of the General Symptoms.

a. The Rash.—Rose spots were noted in 199 cases, 86.9 per cent. In nine cases they were very abundant, occurring not only on the trunk, but on the arms and thighs. In one instance, a lad of 14, they were present on the face.

In two instances there were small petechial spots. In one of the cases (Hos. No. 469) the attack was very severe, and the patient died. In one of the fatal cases there were extensive ecchymoses.

A diffuse erythema, usually punctiform, and in most instances about the thorax and abdomen, was noted in seven cases. It was present usually at the time or shortly after admission, and disappeared in all instances within two or three days. In one case it was also on the arms and about the joints (168).

In one case, a boy of eight, there was an urticarial rash on the face.

Peliomata—taches bleuâtres or maculæ ceruleæ—were noted in several instances, always in association with pediculi.

b. The Fever.—The temperature was taken every two hours in the rectum, unless there was special reason against it.

In hospital practice there are but few opportunities of studying the fever of onset. There were two instances in which, contrary to the general rule, the temperature reached the fastigium on the second day. One is the interesting case, to be given under the section of "typhoid fever and malaria," in which within 24 hours, from 4 p. m. on the 22nd of October to 4 p. m. on the 23rd, the temperature rose eight degrees, and then remained high. The other instance illustrates how abruptly the temperature may rise at the starting-point of a relapse. In No. 3684, after seven days' apyrexia, the temperature rose more than seven degrees in 36 hours. This was the starting-point of a relapse, and the temperature did not reach normal again for fifteen days. An instance in which a gradual step-like ascent

of the temperature occurred day by day was in Sallie R. (Hos. No. 4716), a case admitted for chorea, and which developed typhoid fever after thirteen days' stay in hospital.

There were 152 cases, 66.3 per cent., in which at some time during the disease the thermometer registered 104° and over. Eight cases only had temperature above 106°; in one the register was 107°. Fifty-nine cases had a temperature between 105° and 106°, and eighty-five cases had a temperature between 104° and 105°. Of t e 85 cases with a temperature between 104° and 105° there were 7 deaths, 8.2 per cent. In the 59 cases with a temperature between 105° and 106° there were 10 deaths, 16.9 per cent, and of the 8 cases with a temperature above 106° there were 4 deaths, 50 per cent. There was only one fatal case with a temperature below 104°, a man aged 70, who was admitted in a state of extreme debility, with consolidation of the left lower lobe, and the case was regarded as one of pneumonia.

c. Pulse.—There were 97 cases with a pulse rate of 120 and over. The following is the ratio of mortality to pulse rate: above 160, 10 cases, of which 7 died; 150–160, 5 cases, of which 4 died; 140–150, 15 cases, of which 5 died; 130–140, 15 cases, of which none died; 120–130, 52 cases, of which 5 died. There was one fatal case with the pulse rate below 120. Two cases presented during convalescence very slow pulse, one at 46 (case 126), and another at 56 (case 112) per minute.

d. Diarrhœa.—The bowels were loose in only 76 cases, 33.2 per cent. Of these, in 28 the discharges were frequent; in 48, moderate or slight. In 153 cases there was no diarrhœa. The condition of the bowels in the fatal cases was as follows: in 7 cases the diarrhœa was slight, in 10 it was profuse, and in 5 there was no diarrhœa.

d. Spleen.—The organ was enlarged sufficiently to be felt beneath the costal margin in 147 cases.

2.—Relapse.

In the 229 cases there were 18 cases of relapse, 7.8 per cent. Only those cases were regarded as such in which, after a period of apyrexia, the fever recurred and persisted for more than a week, and in which two or more prominent symptoms of the disease were present, as the rash, enlarged spleen, or gastro-intestinal symptoms.

The nature of the relapse in typhoid fever remains obscure. We speak of a fresh invasion of the bacilli, a fresh formation of the toxins, but why the disease should start afresh after a week's convalescence, and perhaps pursue a more severe course than in the original attack, or why in some cases there should be a second or even a third repetition, we remain completely ignorant. We do not even know whether the incidence depends on endemic influences (as would appear from the great variation in the frequency of relapse in different places), on influences which affect the *seed*; or on peculiarities in the individual organism, influences which affect the *soil*, exhausted quickly by the first crop, but renewed as quickly, and again rendered susceptible. The first attack gives, as a rule, that intimate and remarkable modification of the tissues, fluid and solid, which we call immunity; but, failing this, however produced (weakness of the army of phagoctyes? failure of the development of the antitoxins?) the organism is again liable to infection. On any view it is difficult to understand why indiscretions in diet should sometimes precipitate a relapse.

There were no relapses in the first 33 cases treated on the symptomatic plan. In the 196 cases treated since the introduction of the cold-bath treatment there were 18 definite relapses, 9.2 per cent. The days of apyrexia were as follows: 12, 3, 5, 10, 4, 7, 6.

All of the cases of relapse were bathed. Four cases died.

We cannot follow accurately the rule of calling nothing a relapse without a definite period of apyrexia. In rectal temperatures the normal limit must be placed at about 99°; and after the decline in the original attack, a period of some days with a temperature between 98° and 99.5° should be regarded, particularly in a young person, as an interval sufficiently definite. Thus Ada B. (Hos. No. 5430) was admitted about the 10th day with a severe attack. By the 20th day the temperature had fallen to 99°, then on the 21st, 22nd, 23rd and 24th days the temperature was between 99° and 100°, occasionally falling to 98°, and twice in these four days rising above 100°. Then on the 24th, 25th, 26th, 27th and 28th days there was a gradual ascent and the temperature reached 102.5°. On the 28th it reached 104.5°. The spleen enlarged and there was a crop of rose spots, and it was not until the 35th day that the temperature reached normal.

Strictly adhered to, this rule would exclude a group of cases of great interest in which the fever subsides, the symptoms improve, but the temperature does not reach normal, and then in a day or two there is a marked recurrence of all the features; thus, in Hos. No. 6487, a young girl, aged 13, was admitted December 24th, towards the end of the second week of the primary attack, in a condition of severe delirium. About the beginning of the fourth week, that is, January 2nd, the temperature for the first time reached normal, and throughout the day remained between 98° and 99°. Then on January 3rd she had a chill, in which the temperature rose to 105°; in the evening it fell to 99°. Then throughout the 4th the temperature was between 104° and 105° for the greater part of the day. On the 5th it fell again to 102°, and on the 6th it was normal for the greater part of the day. On the 7th, 8th and 9th the temperature was irregular, rising each day above 103°; then on the 10th it was between 99° and 100°, so that altogether there was a period between January 2nd and the 11th of nine days of irregular fever. Her general condition was good and we thought convalescence was beginning. Then, on the afternoon of the 11th the temperature rose to 104°, and by midnight to 106°, and for six days she was desperately ill, the temperature constantly in the neighborhood of 104° and 106°, and she was so feeble that she could not be bathed. Then on January 18th the temperature fell to normal, and she made a very satisfactory convalescence. In this second attack of severe fever she had a rose rash, and the spleen again enlarged. It was certainly a relighting of the disease, but from January 2nd to the 11th, though the temperature dropped to normal on several occasions, she could not be termed a convalescent. There are in all four cases of this kind, inclusive of the one just mentioned.

Albert S. (Hos. No. 1830) had a moderate fever, which by the 14th day had fallen to normal, and on the 14th, 15th and 16th days the temperature was between 98° and 100°. Then it rose, and by the 18th had reached 104°, a higher point than at any time in the original attack, and the spleen again enlarged and he had a fresh crop of rose spots. The temperature did not reach normal again until the beginning of the fifth week.

Henry L. (Hos. No. 400), aged 16, entered in the second week of a well-marked mild attack. The temperature on the 12th, 13th, 14th and 15th days touched normal, but always rose through the day to

101°. All the symptoms improved and he looked as if he was entering upon his convalescence. Then on the 16th, 17th and 18th the temperature was between 99° and 100°, and on the 19th day rose to 103°. The spleen enlarged and there were rose spots. The second attack lasted for only eight days, the fever gradually subsiding.

It is impossible to draw a hard-and-fast line between these cases and the genuine relapse. This is well illustrated by the following cases:

Annie M., aged 23 (Hos. No. 4556), admitted about the eighth day of a very severe primary attack. On the morning of the 24th day the temperature touched 98°, then on the 25th, 26th and 27th it ranged from 100° to 104°, on the 28th day it again reached nearly 98°, but on the 29th, 30th and 31st there were no marked drops and the temperature was between 101° and 103°. About the 31st day the temperature began to rise, and she entered upon a period in which the evening rise was up to and above 104°. There were rose spots which came out in crops, and this recurrence formed a very severe attack. Even with the sponging, between the 31st and 43rd day, the temperature did not sink below 101°. From the 45th day the temperature was lower. She gradually sank and died on the 49th day. Here was a case in which it was impossible to say there had been any interruption in the pyrexia for more than an hour or so at a time, but taking the symptoms as a whole, there can be no question that she had a very definite and positive relapse.

Mary McG., aged 13 (Hos. No. 6405), admitted with fever which began two weeks ago with severe headaches. For the first 10 days in hospital there was scarcely a day in which the temperature did not rise to 105°, and once rose to nearly 106°. The baths and spongings had very little influence. On December 16th and 17th the temperature became a little more irregular, and from the 17th to the 30th, nearly two weeks, there was a remittent type of fever, the temperature falling each day to the neighborhood of 100° and then rising in the evening to 103° or 104°. These remissions were very marked on December 24th, 25th, 26th and 27th, when the evening temperature sank on each day to 99°. Then on the 28th, 29th, 30th and 31st the morning remissions were not so marked, and the evening exacerbations were a little higher, reaching 104°. On the 42nd and 43rd days of her illness the fever became more continuous, and from January 1st to the 9th she had fever from 103° to 105°, with very slight remissions. The

spleen became distinctly palpable and the tongue was furred. She had no definite rose spots. On the 10th and 11th of January the temperature fell, and on the 12th, the 53rd day of her illness and the 40th of her stay in hospital, it reached normal and remained there. Here an interval of marked remittency in the temperature separated two periods of continued fever.

A protracted fever may develop in consequence of a post-typhoid anæmia and must not be taken for a relapse. In the case of Carlo C. (No. 2132), the patient had a severe attack with high fever, the temperature ranging between 105° and 106°. On the 22nd day convalescence began, and for four days the evening temperature was at 98°; then, between December 5th and the 21st the temperature was constantly between 99.5° and 101°. He had, however, a profound anæmia (the case is referred to under the section on post-typhoid anæmia); and though the spleen was enlarged, his general condition was good, and it was, I think very correctly, not regarded as an instance of relapse. From January 6th to the 10th the fever was still high, once rising to 104°, but he looked well and there was no evidence of local trouble. There were no spots.

3.—Post-typhoid Elevations of Temperature.

During convalescence there may be a return of the fever for short intervals. There were eighteen instances in which, after a period of normal temperature, the fever recurred. Various temperature anomalies of convalescence must be carefully distinguished from these so-called recrudescences or post-typhoid elevations. It is important to recognize the fact that in young children, and in very nervous subjects, the afternoon temperature may be persistently above 99°. With a clean tongue and gaining strength this may be neglected, and when strong enough the patient may be allowed to get up. Though really of no moment, the condition may be the cause of no little anxiety to the physician and to the friends. Then again, a well recognized cause of persistence of the fever in convalescence has already been referred to in connection with the anæmia. Boils, too, may keep up a slight fever. Apart from these, and independent of complications and sequelæ, there are curious and not altogether well understood elevations of temperature. They are really of very great interest, inasmuch as their onset is apt to be regarded as a

relapse. The following are brief notes of the eighteen cases in which, after the establishment of normal evening temperature, irregular elevations occurred:

Case I.—Henry H. (Hos. No. 392); mild case, afebrile on the 23rd day. Ten days subsequently the temperature rose to 101°, and remained between 99° and nearly 101° for 36 hours. He had had solid food on the 7th. He had been constipated for five days. With the return of the fever there were no special symptoms.

Case II.—Charles S., admitted June 7, 1891 (Hos. No. 3244). A very protracted and severe attack. The decline in the fever was very slow, and it really was not until the 50th day that the temperature was normal; then, every day or two he had an evening rise to 100° or 101°. From the 61st to the 67th day the temperature was normal; then from the 67th to the 75th day the temperature rose every afternoon, and on the 71st, 72nd and 73rd reached nearly 103°. There was nothing apparently in his condition to account for this rise in temperature. He was at times constipated, but it was never very clear upon what fever depended. He ultimately made a satisfactory convalescence and was discharged from the hospital on the 79th day.

Case III.—A. G. (Hos. No. 3260), admitted on the 12th day of a mild attack. The temperature was normal on the 21st day. Then from the 23rd to the 29th day the temperature range was from 97° to 99.5°. On the 30th, 31st and 32nd the temperature rose to between 101° and 102.5°. On the 37th day the temperature rose to 102° and remained elevated for 12 hours, then became normal and remained so. There was nothing in the condition to account for this subsequent rise.

Case IV.—Wm. S., aged 24 (Hos. No. 3552), admitted on the 7th day of a moderately severe attack; temperature range from 103° to 104.5.° On the 21st day the temperature was normal and did not rise above 98.5° until the evening of the 26th day, when it began to rise and on the 27th day was 103.3°. The edge of the spleen could be felt, and as there were a couple of doubtful rose spots, we began the baths again. A relapse seemed probable, but on the 28th day the temperature fell and was 99.5° in the morning. From the 28th to the 43rd day he seemed perfectly well and he gained in weight. Then on the 43rd day, 18 days from the previous elevation, the temperature rose rapidly in the morning to 105.5°. There were

no chills, the spleen was not palpable, the abdomen looked natural. The patient was sponged; the temperature remained on the 44th day between 101° and 102°. On the 45th day it fell gradually, and was normal from the 46th to his discharge on the 67th day. Here, too, it was impossible to attribute this rise to any error in diet or to special constipation.

Case V.—Eva S., admitted August 23rd, 1891 (Hos. No. 3708), on the 14th day of a moderately severe attack. The temperature was normal on the 27th and 28th days. On the 29th it rose to 103°, on the 30th it rose to 105°, and on the 31st to 103.5°. From the 32nd to her discharge it remained normal. This patient was excitable and nervous, and very constipated. Here the sudden elevation to 105° after the temperature had been gradually falling for more than a week and had been normal for two days made us suspect some complication, but nothing was found to account for it.

Case VI.—Richard B., aged 19 (Hos. No. 4083), admitted October 21st, on the 8th day of a very severe attack. The temperature reached normal on the 24th day and remained so until the 27th day, when it rose to 103° and remained between 102° and 103° until the following morning. Looking for the probable cause of this, two small abscesses were found on the back. His convalescence was very protracted; he did not gain strength rapidly, and on January 1st, 2nd and 3rd, the 81st to 83rd days from the onset of his symptoms, the temperature rose to 101° without any cause.

Case VII.—Charles R., aged 19 (Hos. No. 4116), admitted October 26th, on the 8th day of a mild but protracted attack; temperature fell to normal on the 25th day. On the evening of the 29th the temperature rose to 102°, and kept up the next day without any obvious cause. He had not had solid food. The convalescence was slow, and on the 47th, 48th and 49th days he had a second attack of fever, the temperature reaching 103°, after which the convalescence was established.

Case VIII.—Gustave W., aged 22 (Hos. No. 4452), admitted December 27th, and had a very severe and protracted attack, the temperature not falling to normal until the 35th day. He recovered very slowly and had hysterical attacks. From March 11th to the 15th the temperature ranged from 99.5° to 102°. The tongue was a little coated and he complained of headache. The spleen was still palpable, and on the back and abdomen there were a few suggestive

spots. On the night of the 14th he was also delirious. We thought that it was possibly a very late relapse, but the temperature fell and on the 18th day was normal. He had not been constipated, and at the time of the fever he had been having solid food for between two and three weeks.

Case IX.—Louis M., aged 17 (Hos. No. 4458), admitted on the 10th day of an attack of moderate severity. The temperature on the 20th day was normal. From the 20th to the 30th day the temperature range was from 97° to 99°. From the 17th of January, the 30th day, to the 2nd of February there was mild fever, the temperature rising every day to 100°–101°, without complications or unfavorable symptoms, and it seemed an instance of protracted post-typhoid fever rather than a definite relapse. He was not constipated; he sat up February 7th and made a good convalescence.

Case X.—George P., aged 21 (Hos. No. 5737), admitted on the 8th day of a severe attack. The temperature fell gradually, and was normal from the 31st to the 50th day, when without any obvious cause it rose on the 51st, 52nd and 53rd days to 100° and 102°. The tongue was slightly furred; the spleen not enlarged. There was no constipation.

Case XI.—David Martin (Hos. No. 5900), a very protracted case, in which the temperature did not fall to normal until the 33rd day. The patient was febrile from the 45th to the 52nd day, due apparently to a phlebitis of the left femoral.

Case XII.—Wm. W., aged 23 (Hos. No. 5937); case of moderate severity. Temperature normal on the 15th day. From the 25th to the 28th day the temperature ranged from 99° to 101°. This occurred when he was up and about the ward, and did not disturb the convalescence.

Case XIII.—Minnie —, aged 22 (Hos. No. 5995), admitted September 29, 1892, apparently late in the disease. The temperature was irregular and fell to normal October 9th. From October 19th to 27th the temperature rose once to 104° and every day to nearly 103°. She had one or two sweats; the abdomen was flat, not sensitive, no spots, tongue perfectly clean; bowels regular. Convalescence undisturbed.

In very protracted cases the convalescence is often slowly established, and the temperature may be normal for a day or two and then slight elevations will occur for four or five days without any special significance, thus:

Case XIV.—Chris. Meyer, aged 52 (Hos. No. 6095), had an attack of great severity, and from the 43rd day to the 53rd day the temperature had been falling gradually and ranging from 98° to 101°. Then from the 53rd to the 59th day it was normal. From the 58th to the 70th there was every day a rise of from 2° to 2.5°, without any aggravation of the general symptoms. Possibly this slight fever was associated with a crop of boils.

Case XV.—Lillian R., aged 28 (Hos. No. 6214), admitted October 30th, 1892, with an attack of moderate severity, and the temperature was normal by November 9th, in spite of a moderate parotitis. On November 25th, 26th and 27th the temperature gradually rose, reaching 103°, and fell through the 28th and 29th. No abdominal symptoms.

Case XVI.—Charles H., aged 16 (Hos. No. 6270), admitted November 10th, 1892, on the 8th day. The temperature was normal by the 20th day. On the 21st there was a rise to 102°, and then it fell to normal. Then on the 27th to the 30th the temperature range was between 99° and 101° without any obvious cause. No enlargement of the spleen or furring of the tongue.

Case XVII.—Edward H., aged 23 (Hos. No. 5792), admitted on the 7th day. Temperature reached normal about the 22nd day, and on the 28th temperature rose to 103°, then to 105°, and throughout the 29th kept above 101°. It fell gradually on the 30th, but remained between 99° and 100° for several days. It was at first thought to be a relapse, but no spots were seen, and the spleen was not palpable. The patient had a very marked dicrotic pulse.

Case XVIII.—John F., aged 20 (Hos. No. 1918), admitted October 10, 1892, on the 15th day of a protracted attack, with moderately high fever. On the 36th, 37th and 38th day the temperature was normal; then on the 39th, 40th and 41st the highest range was from 101° to 103°, and it was not until the 48th day that the temperature was again normal. There were no abdominal symptoms; the spleen was not palpable, and there were no rose spots. He was not constipated.

4.—Typhoid Fever and Malaria.

The belief in a specific typho-malarial fever—a hybrid of definite etiological and clinical features—has been generally abandoned, though the name persists in Health Reports; thus, in the mortality

returns for the city of Baltimore for 1892 there were 33 cases under the heading typho-malarial fever. We have had very good opportunity of studying the relations of the two diseases, as there have been under treatment in the medical department about 500 cases of malarial fever during the time in which the 229 cases of typhoid fever were admitted.

We do not profess always to be able to distinguish in their early stages cases of malarial fever from cases of typhoid fever. So much alike are they that frequently patients have been sent to the wards from the dispensary and have had their heads shaved and the bath treatment ordered. The routine order in all fever cases is to have careful and repeated examinations of the blood during the first two days. If Laveran's organisms are absent, malaria is definitely excluded. To mistake typhoid fever for malaria is much less rare than to regard a case of remittent as one of typhoid. There was no case with the characters of the two diseases so blended that it seemed a compound or hybrid malady, nor was there an instance in which the manifestations of the two diseases were *concurrent.* Very many patients with typhoid and malarial fever were admitted from the same low-lying sections of the city and the suburbs, districts in which both diseases prevail extensively in the autumn, so that it would have been strange not to have met with some cases of the combined infection.

In three cases there was a definite history of malaria within a few months of the onset of the typhoid fever. Martin M. (Hos. No. 4027), admitted October 12th, 1891, had had, three weeks before his admission, chills every other day for a week; then the next week on every day, followed in each instance by fever and sweating. Subsequently the bowels became loose, and on admission he had a continuous pyrexia between 104° and 106°. The blood was negative. It was noted the second day after admission: "This case is of interest, coming from Sparrow's Point. He had been exposed to malaria, and probably had three weeks ago genuine intermittent fever; he has had no sweats and no chills since admission."

The disease ran an ordinary course, the fever presented nothing uncommon, the temperature gradually declined, and he made a satisfactory convalescence.

A second case, Richard B. (Hos. No. 4083), admitted October 1st, 1891. A month before admission had had for a week tertian

intermittent fever. He took quinine and got better, having no further chills, but did not get quite well, having headache and prostration. He stopped work ten days before admission. He was actively delirious and had a temperature of 104°. The typhoid fever ran a course of moderate severity; he took the baths well; had no chills; the spleen was greatly enlarged. There was nothing in his case to call attention in any way to the fact that a month before he had had malaria.

A third case, John C., aged 19 (Hos. No. 4172), was admitted November 4th, 1891, from Sparrow's Point. In the spring of the year he had severe malaria, for which he took a great deal of medicine. He had it on and off through the summer. He was ill for a month before admission; no distinct chills, but creepy sensations and irregular fever. This patient had a very mild attack, well-marked rose spots, no special enlargement of spleen. No features in the case in any way suggested a malarial taint.

The following case is the only one in which the patient, admitted with malaria, definitely shown to be so by the examination of his blood, subsequently developed typhoid fever. The patient, a man aged 20, had, during sixteen days prior to admission, headache and cough, occasional nose-bleeding and three chills. On admission, October 16th, the temperature was 100°, but fell in the early morning of the 17th to 96°. The malarial parasites were found to be present in the blood. He was ordered quinine, four grains three times a day. On the 17th the temperature began to rise a little after 12 a. m., and at 3.30 p. m. he had a chill, after which the temperature rose to nearly 105°, then fell throughout the next night, and was normal at 8 a. m. The case was one of ordinary tertian intermittent, and the quinine was continued. On the 18th, 19th, 20th, 21st and 22nd the temperature was normal or subnormal. A two-hourly temperature had been taken. Up to 8 a. m. of the 22nd he had taken 80 grains of quinine. He had no more fever and the malarial parasites had disappeared from the blood. At 8 a. m. on the 22nd the temperature was 97.5°. At 4 p. m. it was 98°. It gradually rose through the evening, and at 12 midnight it was 102.5°. The next morning it was 102.2°, rose throughout the day, and from 4 to 8 p. m. was at 105°; so that within the 24 hours from 4 p. m. on the 22nd to 4 p. m. on the 23rd the temperature had risen 7°. Naturally we thought this was a recurrence of the malaria, in spite of the administration

of the quinine, of which he had had 96 grains up to 10 a. m. on the 23rd. From 8 p. m. on the 23rd throughout the 24th and 25th the temperature remained practically between 103° and 105°, uninfluenced by the quinine (which was continued), and only influenced slightly by sponging. The quinine was continued until noon on the 26th. The whole appearance of the man was suggestive of typhoid fever, and subsequently spots appeared, the spleen enlarged, and the disease ran a perfectly normal course, typical, but of great severity, the temperature not falling to normal until between the fifth and sixth weeks. The temperature chart annexed gives a fac-simile of the ward temperature chart, and shows the single malarial paroxysm and the abrupt onset of the typhoid fever and its persistence. The patient had in all 68 baths, and made a good recovery.

5.—Complications.

Digestive System.

(*a*) *Parotitis.*—This occurred in five cases, of which one died. It occurred in the left parotid in two; in the right, in two; on both sides, in one. In three cases it was opened; in two the swelling subsided.

(*b*) *Melena* occurred in eight cases, of which three proved fatal. Notes of the fatal cases have been given. Hos. No. 6086, Patrick S., aged 27, had a very protracted attack of typhoid fever; was in hospital 67 days, had 87 baths, a long-continued high fever very little influenced by baths or sponging. He had at intervals ten hemorrhages, none of them very large.

Hos. No. 6198, Wm. P., aged 32, also a protracted case, had repeated hemorrhages, but none very severe.

Hos. No. 6235, Jos. R., aged 29, had one hemorrhage, not more than two ounces.

Hos. No. 6329, Wm. McM., aged 32, had a single small hemorrhage from the bowels following prolonged constipation.

Hos. No. 7318, Wm. E., aged 38, had moderately severe attack with relapse; small hemorrhage during relapse.

With the onset of the hemorrhage the baths were omitted. The pill of acetate of lead and opium was given, and cold applications applied to the abdomen.

(*c*) *Hematemesis.*—John M., aged 40 (Hos. No. 1683), admitted August 21st, 1890, with a history of illness of some weeks' duration,

the chief symptoms headache and fever. The blood examination was negative, and there was a very definite rose-colored eruption. The temperature was never high, not rising above 103°. On the 27th he had vomiting, and in one of the attacks he brought up a dark, greenish-brown fluid containing red blood corpuscles in a condition of disintegration, and a clot of blood about 3×2 cm. in diameter. On the 29th, 30th and 31st the stools were very dark in color and evidently contained blood, and several times he vomited very dark material. He became very anæmic, but made a good recovery.

NERVOUS SYSTEM.

(*a*) *Typhoid fever in a case of chronic chorea and epilepsy; disappearance of the choreic movements.*—Sallie F., aged 21 (Hos. No. 4716), admitted February 16th, 1892, complaining of spasms and twitching, which had lasted for about six months. She falls and becomes unconscious and bites her tongue. A year ago she began to have irregular involuntary movements of the muscles which have persisted. There is a marked neurotic history; the mother has been of unsound mind.

On admission she was well nourished, face a little thin and marked with scars, a large one on the forehead, one on the bridge of the nose, and one on the right side of the face. She was perfectly rational and gave an intelligent account of her symptoms. Occasionally during the examination she had involuntary jerking movements of the arms and of the muscles of the trunk. They occurred also occasionally in the legs. The movements were quick, sharp and sudden, not rhythmical. The reflexes were somewhat increased, sensation good, there was no hemianæsthesia, no heart murmur. There were several dark-colored spots on the legs and a suspicious onychia on the ring-finger of the right hand, so that she was ordered iodide of potassium. During the first week in hospital the choreiform movements became worse; thus on the 26th of February I made the following note: "Patient is worse; movements are now so extreme that she is unable to feed herself. There are many sudden electric-like jerkings of the muscles of the face, hands and trunk. Sometimes she jerked herself a little distance off the bed. The movements are like those of ordinary chorea except that they are rather more electric-like in character." From March 2nd to the 7th she was feverish, with gradually

ascending temperature, until it reached 104°. She complained of aching in the back and legs. The tongue became much furred. The fever persisted, and on the 11th several very suspicious-looking spots were seen. She developed a very well characterized attack of typhoid fever of moderate severity. As the fever developed the choreic movements became much less and gradually disappeared, though at the height of the fever she had some slight tremor and subsultus. The fever persisted until April 3, and then she made a very satisfactory convalescence. With the decline of the fever early in April the choreiform twitchings gradually reappeared and became almost as severe as at the time of her admission.

This patient was in hospital exactly thirteen days before the initial rise in the fever. There were several patients with typhoid fever in the ward, and one in the next bed to her, so that it is possible that it may have been an instance of ward infection, though the fever started within the limits of incubation of an outside contagion.

(*b*) *Melancholia.*—In three instances the patients during convalescence became profoundly depressed and melancholic.

George W. (Hos. No. 3922) was admitted September 24th, 1891, in the third week of typhoid fever, with a temperature of 103° and with a marked splenic tumor. The patient had only three baths, and the temperature was normal within a week after his admission. He entered upon a very satisfactory convalescence. On October 16th after he had been up for three days, it was noted that he had a peculiar mental condition, having an idea that he was going to die. Within a week this became much more manifest. He thought that he was going to be executed and was very much frightened about it. He saw and heard, as he insists, the headsman read his condemnation to death. After a few days of this delusion he said that he was ashamed of himself; then he became again very apprehensive, and about the second week of his convalescence sank into a state of profound melancholia. He did not speak to anybody, would scarcely answer a question, ate little, slept badly, and looked very much depressed. His physical condition improved after the middle of October, and on October 26th he was taken to his home by his friends, still very melancholic.

Pauline L., aged 28 (Hos. No. 5685), admitted August 4, 1892. This patient had a very severe attack with a well-marked relapse. She, however, took the baths well and had no special delirium, but

once or twice was very restless and nervous. The temperature fell to normal about the 28th of August, and during the seven or eight days of apyrexia she was profoundly melancholy and would not speak and could scarcely be induced to eat. In the relapse, which lasted nearly three weeks, she was very nervous, complained a great deal of distress about the heart, and she had constant fears that she was not going to get well. As the fever declined, however, and she entered upon convalescence, she got brighter mentally and looked very much more cheerful, and ultimately made a satisfactory recovery.

Henry N., aged 32 (Hos. No. 6304), admitted November 15th, 1892. He was admitted in the first week of the disease and had a moderate but somewhat protracted attack. He had no delirium. He was always very depressed and looked dejected. As he entered upon the convalescence this depression became very marked and he would not talk, and was with difficulty induced to eat. Early in January he had a slight recurrence of the fever; then he gained rapidly in weight throughout the middle of January and improved very much in spirits, and when he was discharged on January 25th his mental condition was very good.

(*c*) *Hysteria.*—There were four cases with hysterical manifestations. In one (Hos. No. 4113), they seemed to develop in consequence of the baths. The man became very nervous and complained a great deal about them and had crying spells. He had also marked general tenderness and complained of pains in the throat and different parts of the body. The convalescence was, however, satisfactory.

The second case (Hos. No. 3721), male, aged 18, had most pronounced hysteria. He had a pretty severe attack of fever, lasting throughout the greater part of September. On the 10th of September, at 5 p. m., he complained of difficulty in swallowing, was very restless, the eyes were closed, and he did not speak. He made signs to his throat and nodded his head repeatedly for a minute or two at at a time. He held his tongue between the teeth and shut the teeth upon it. The expression of his face indicated that he was biting it, which he did not do. He rolled from side to side and swayed his body to and fro. He was at this time having baths. The following morning he had the same demonstrations and was very noisy. He behaved queerly all through his illness and had several very pronounced hysterical attacks. With the subsidence of the fever they ceased.

Gustave G., aged 22, admitted December 27th, 1891, with a severe attack, the temperature not reaching normal until January 23rd. At times, when the fever was high, he was delirious. On the evening of the 27th of February he had a pronounced hysterical attack, throwing himself on the bed, breathing in a hurried manner, and presenting very peculiar twitchings of the eyelids. He was spoken to sharply and the gas turned down, and he went to sleep quietly. On the 6th of March he had a second attack, while sitting in a chair, when he suddenly complained of a pain in the head, fell on the floor and behaved in a distinctly hysterical manner.

Perhaps the most interesting case was that of a young girl aged 13 (Hos. No. 6497), who was admitted December 24th, 1892. She had been ill for at least two weeks with very odd nervous symptoms, and which, though she had fever at the time, were regarded as hysterical. She behaved in a very odd and peculiar manner, had crying spells, was very restless, and sometimes quite delirious at night. So definitely hysterical were these initial symptoms that until a day or two before admission the case was regarded as one of pure hysteria. During her stay in hospital she had an unusually severe attack with a definite relapse and had delirium, but no subsequent hysterical symptoms.

(*d*) *Neuritis.*—C. W., aged 25, admitted October 8, 1890. Patient had a moderately severe attack, and the temperature did not reach normal until the 27th day. On October 18th, that is, on the 14th day of the fever and while the temperature ranged between 102° and 103°, she began to complain of pains in the arms. She had not had a cold bath since the 10th day, October 14th. The pains were neuralgic in character. On the 19th the note reads, "This morning pain is very much worse, she can scarcely lift the arms. There is no swelling of the joints or any tenderness about them on the firmest pressure. The soreness is particularly in the muscles. She winces at once when they are grasped. The biceps is particularly tender. There is no swelling of the ulnar nerves, no soreness in the brachial plexuses in the axillæ or above the clavicles. The pain to-day is not shooting in character, but it extends down to the fingers. There is no numbness. The pain is so severe that the arms are kept on a pillow and she is quite unable to move them." On the 20th the note reads, "Soreness persists. Cannot lift the arms; fingers can be moved. The pain is continuous. There is no disturbance of sensation, no pins and needles, no swelling of the joints; the

legs are not painful." On the 22nd the note reads, "The hot applications have relieved the pain somewhat. Yesterday the hands were quite numb. She says the hands ache like toothache. Joints not swollen; arms and forearms still very sore to touch." From the 18th to the 30th this condition persisted with very little change. She had lead and opium applications and antipyrin internally. The temperature meanwhile gradually fell and her general condition improved. On November 2nd the note is, "Arms very much better; pains still in the left arm and she can move the arms well; no wasting of the muscles." Within the next two weeks she improved very rapidly; the pains in the arms gradually disappeared, and she recovered completely without any wasting of the muscles. The pain in this case was of a most aggravated character, causing the patient sometimes to cry out.

John M., aged 27 (Hos. No. 4171), admitted November 4, 1891, on the 10th day of a mild attack. On the 25th of November, when he had been already convalescent more than 10 days, he complained of very severe pain in the front and back of the left leg, which came on suddenly. There was distinct sensitiveness over the nerve trunks, the posterior tibial, and the peroneal, and particularly along the tibialis anticus muscle. The toes were also sensitive and there was a dulling of sensation in them. Throughout the 26th this condition persisted and it seemed probable the patient was going to have a severe post-typhoid neuritis, but on the 27th he was very much better. There was no tenderness, and the sensitivess in the anterior tibial muscles had disappeared.

Mary McG., aged 13 (Hos. No. 6405), admitted December 4, 1892, about the end of the second week of what proved to be a very severe attack of typhoid fever. The temperature kept up for an unusually long time, and she became so feeble that after the 44th bath they were discontinued. It was not until the end of the 5th and throughout the 6th week that the temperature fell to normal. On December 14th, while the temperature was still high, having been constantly for several days in the vicinity of 105°, and after she had been sponged with ice-water for two days, she began to complain of very great pain in the right arm and in the right leg, of such severity that she cried out constantly and she had to have morphia. These attacks continued between the 14th and the 20th with great severity. In the right arm the pain soon subsided; there was no involvement of the joints; no pain along the nerve trunks. She screamed out if

any attempt was made to move the right leg. There was no tenderness about the hip, no swelling of the knees, and repeated examinations seemed definitely to exclude any articular trouble. Grasping the leg at any place seemed to cause extreme pain. On the 18th, three patches, like erythema nodosum, appeared on the right foot, one at the metatarsal joint of the small toe, one midway between the heel and toes, and one on the outer and back part of the heel. They looked like large chilblains, and around one there was a distinct bluish discoloration. The two smaller ones disappeared within a day or two. The larger one on the heel remained red for some days. There was no superficial necrosis. She never seemed able to localize the pain accurately. It was never definitely in the situation of the sciatic nerve. It was quite uncontrollable by anything but morphia. After causing great anxiety to us, and distress to the patient, for nearly ten days, the pain subsided and had disappeared by the 25th or 26th, two weeks at least before the temperature became normal.

Wm. McM., aged 32 (Hos. No. 6329), admitted Nov. 19th, 1892, at about the second week. The attack was of moderate severity, the temperature ranging between 103° and 104.5°, and not falling to normal until the fifth week. Just about the time the temperature became normal, that is on the 12th of December, the patient complained of general soreness and pains in the limbs, particularly in the arms, and he winced on pressure upon the forearms and arms. He had been in very good condition and convalescence seemed well established. The grasp of both hands seemed weak, but particularly the left, and he complained of a sensation of pins and needles in the left foot. There was no tenderness along the nerve trunks; no pain on pressure on the muscles of the calves; he winced a little when the muscles on the right thigh were pressed. On the 17th of December the note reads, "Left arm looks somewhat swollen and feels tense. It is not red; the temperature is not elevated. He moves the muscles with difficulty and says the arm is very sore. On the inner part of the upper arm there is very great tenderness along the course of the brachial artery and of the nerve trunks. The ulnar nerve is also somewhat tender at the elbow. There is tenderness of the muscles, particularly of the biceps and of the extensors of the upper arm. There is no anæsthesia; no sensation of pins and needles. All movements in the limb cause him pain. There are flying pains in the legs, but no swelling; no tenderness; knee jerks were increased; no

ankle clonus." The swelling and tenderness in the right arm gradually disappeared within ten days and there was no wasting of the muscles.

(*e*) *Local Vaso-motor Neurosis.*—John B., aged 21 (Hos. No. 6946), admitted March 4, 1893. He had, shortly after admission, a very peculiar condition of the soles of his feet in the neighborhood of the heel. The note reads, "The soles of the feet, particularly in the region of the heel, are swollen and red; the line of redness extends along the lateral aspect of the foot. The color is a bluish red; there is marked swelling, not much pain; the toes are not affected." Within a week the swelling had almost disappeared from the region of the heel, but on the dorsum of the foot there were two spots of redness and œdema, and two spots on the inner side of the right ankle and one on the outer side of the leg. These were reddish, raised and swollen. On the 21st this patient had slight pain in the right wrist without any swelling. The patient had a mild attack, and by March 30th the temperature was normal. He had during convalescence some pain in the right forearm and wrist without any redness.

(*f*) *Tender Toes.*—A very distressing and peculiar form of acroparæsthesia—as these digital and dactylic disturbances of sensation have been termed by Fr. Schultze—was present in a number of the bathed cases, viz., exquisite sensitiveness of the toes, sometimes of the soles and dorsal surfaces of the feet. An appearance similar to chilblains has frequently been noted after the cold bath, but no special connection has been observed between it and the tender toes. The condition develops about a week or ten days after the baths have been given, and the first complaint is usually of the pressure of the bedclothes on the feet. No redness or swelling has been noted, nor any change in the appearance of the skin, except the yellow tinge which is not uncommon in the palms of the hands and soles of the feet in typhoid and, I think, other protracted fevers. The slightest touch on the toes caused severe pain. In passing from bed to bed in the ward, I have long had a trick of grasping the feet of a patient through the bedclothes as an emphasis to the morning greeting, a salutation which has been followed in some of the cases under consideration by a burst of tears. I thought at first that the pain might be due to a drying and hardening of the outer layers of the cuticle macerated by the repeated baths, and pressure of it on the sensitive layers beneath, but the skin has always looked natural, and though

there has never been any impairment of muscular power, we have gradually been led to regard the condition as a local neuritis. All the cases recovered without leaving any ill effects. The treatment was not very satisfactory; strong cocaine solutions on cotton-wool proved perhaps the most efficacious remedy.

RESPIRATORY SYSTEM.

Oedema of the Glottis.—The case has been given among the fatal cases and need not be here again considered. There were seven cases of *pneumonia*, two of which died, and the details are given in the section dealing with the fatal cases. One of these was specially interesting from the fact that the diagnosis was made of pneumonia, and the typhoid fever was not detected until the post-mortem. Of the five cases which recovered, in not one was the pneumonia extensive, and the diagnosis rested upon definite dulness, with distinct tubular breathing.

Pleurisy.—There were only two cases of this complication.

Wm. E., aged 38 (Hos. No. 7218), admitted with a well-marked friction and crepitant râles in right axilla. There was no effusion.

Frederick S., aged 20 (Hos. No. 192), admitted August 10, 1889, with perfectly well-marked signs of effusion at the left base, with dulness, absence of tactile fremitus and of breath sounds. The effusion gradually disappeared during convalescence.

CIRCULATORY SYSTEM.

Apart from the gradual failure of the heart power with the bodily strength, generally indicated by a shortening of the long pause (the fœtal rhythm), there were few cases presenting cardiac complications. A heart murmur was present in many instances. This, of course, was not regarded as in any way indicative of endocarditis, but due simply sometimes to weakness of the cardiac muscles, sometimes to the condition of the blood.

Among the fatal cases there has already been referred to one in which there was pronounced arrhythmia cordis. There was no instance of endocarditis, and among the fatal cases, as will have been noted, there were few even of those with signs of progressive heart failure which had marked fatty degeneration of the muscle substance. There were no complications on the part of the arteries. In a case of aortic insufficiency with typhoid fever, the murmur increased

in intensity during the height of the fever, a thrill developed, and we thought possibly he might have had a fresh endocarditis, but of this there was no positive evidence.

Phlebitis.—John C., aged 21 (Hos. No. 5827), admitted August 31, 1892, about the beginning of the second week. The case was a slow, protracted one, and the temperature did not reach normal until about the end of the fifth week. When convalescence had been well established, though he was extremely weak, about the 24th or 25th of October, the left leg became swollen and œdematous, and this gradually extended to the thigh. The calf of the leg felt very firm, and was hard in the popliteal space, and very tender along the upper and inner aspect of the thigh. With this there was no increase in the fever, and his general condition had improved.

Wm. S. W., aged 24 (Hos. No. 2195), admitted November 26, 1890, on the sixth day of his illness. The case was mild, and the temperature was normal by December 25th. On December 19th he had tenderness along the inner side of the left thigh, in the situation of the internal saphenous vein. Within a few days there was much pain and the leg became swollen. There was a well-marked thrombus in femoral and saphenous veins. The leg was bandaged carefully, and the complication did not seriously retard his convalescence. He was discharged on the 15th of January.

Cutaneous System.

Profuse drenching sweat occurred in four cases. *Boils* in large numbers occurred in twelve cases. They were particularly numerous and distressing in the cases treated during the autumn of 1892. In addition there developed in four cases definite skin-abscesses which could not be classified as furuncles.

Osseous System.

Periostitis occurred in the right tibia in case 4683. It developed when convalescence was well established, and did not cause any fever, but was a tender swelling with redness just above the middle of the right tibia. It disappeared without suppuration.

Otitis.—There were three instances of acute otitis media.

(*g*) *Errors in Diagnosis.*—By far the most common mistake was to send a patient from the dispensary to the wards with a diagnosis

of typhoid fever when the condition was in reality malaria. On more than one occasion a patient has had his head shaved and has had baths for twenty-four hours before the error was corrected. Such mistakes have not been so common since a thorough examination of the blood in every case of fever has been made a matter of routine, but we have been occasionally caught napping, as when a patient has had malaria for some time and has been taking quinine, so that the organisms are scanty or absent for a time from the blood.

In two very interesting instances the mental condition at the onset of the disease led to a mistake. In Hos. No. 6497 the error was not on our part. The patient, a young girl of thirteen, had been treated outside for a week or ten days for hysteria, and certainly, according to the mother's account, the symptoms which she presented were quite typical of that disease (the performance of odd and anomalous acts, with laughing and crying spells), yet the fever, which was high when she was admitted, should possibly have given a clue to the condition, about which there was no question when she came under our observation. The second case was a young woman, aged 28, whom I saw on a Sunday afternoon in the admitting room. She was completely "off her head," and the account given by the friends was so unsatisfactory as to the duration and mode of onset of the trouble that I told Dr. Hoch that I did not think the case a suitable one for admission, regarding it as an instance really of mental disease. The temperature was very slightly elevated, the tongue was clean, and the whole behavior was so much suggestive of mental aberration that I was completely led astray. Fortunately Dr. Hurd saw her subsequently, and it was decided to admit her. She had a mild attack; the delirium disappeared and she had no serious symptoms.

In only two cases did the anatomical correct the clinical diagnosis. Both of these are given fully in the history of the fatal cases; one (Case 11) was the old man, aged 70 (Hos. No. 1814) who was admitted in a condition of cachexia, with pneumonia of the right lower lobe. In the other, Case 18 (Hos. No. 5556), the patient had been in the hospital a year before with severe entero-colitis, and when admitted had diarrhœa and an irregular temperature, and not unnaturally he was thought to have a recurrence of his former severe trouble. The only suggestive feature in his case was the presence of the diazo reaction in the urine. He died on the seventh day after admission, and the autopsy showed the lesions of typhoid fever.