

# THE PRINCIPLES AND PRACTICE OF MEDICINE

*DESIGNED FOR THE USE OF PRACTITIONERS  
AND STUDENTS OF MEDICINE*

BY

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Should the fluid be sterile and tuberculosis suspected, a guinea-pig may be inoculated.

**Prognosis.**—Hirsch states that the mortality has ranged in various epidemics from 20 to 75 per cent. In children the death-rate is much higher than in adults.

**Treatment.**—The high rate of mortality which has existed in most epidemics indicates the futility of the various therapeutical agents which have been recommended. When we consider the nature of the local disease and the fact that, so far as we know, tuberculous and other secondary forms of cerebro-spinal meningitis are invariably fatal, we may wonder rather that recovery follows in any case.

In strong robust patients the local abstraction of blood by wet cups on the nape of the neck relieves the pain. General bloodletting is rarely indicated. Cold to the head and spine, which was used in the first epidemics by New England physicians, is of great service. A bladder of ice to the head, or an ice-cap, and the spinal ice-bag may be continuously employed. The latter is very beneficial. Hydrotherapy should be systematically used, in the form of the tub bath, at 98°, as recommended by Aufrecht. Netter speaks highly of its good effects, and we have also seen it do good. It may be given every third hour. If any counter-irritation is thought necessary, the skin of the back of the neck may be lightly touched with the Paquelin thermocautery. Blisters, which have been used so much, are of doubtful benefit. The lumbar puncture seems helpful in cases with coma or convulsions, and in any case it does no harm. Of internal remedies opium may be given freely, best as morphia hypodermically. Mercury has no special influence on meningeal inflammation. Iodide of potassium is warmly recommended by some writers. Quinine in large doses, ergot, belladonna and Calabar bean have had advocates. Bromide of potassium may be employed in the milder cases, but it is not so useful as morphia to control the spasms. Intraspinial injections have been tried, and in one of our cases Cushing opened and drained the spinal canal. Diphtheria antitoxin has been used with success in the recent New York epidemic.

A serum has been prepared and has been used with encouraging success. Flexner recommends doses of 30 cc. of his serum to be injected directly into the spinal meninges after the withdrawal of 50 cc. of cerebro-spinal fluid. Of 400 cases thus treated, collected by Flexner and Jobling, 295 recovered.

The diet should be nutritious, consisting of milk and strong broths while the fever persists. Many cases are very difficult to feed, and Heubner recommends forced alimentation with the stomach-tube. The cases seem to bear stimulants well, and whisky or brandy may be given freely when there are signs of a failing heart.

## XV. LOBAR PNEUMONIA.

(Croupous or Fibrinous Pneumonia; Pneumonitis; Lung Fever.)

**Definition.**—An infectious disease characterized by inflammation of the lungs, toxæmia of varying intensity, and a fever that usually terminates by crisis. Secondary infective processes are common. The *Micrococcus lanceolatus* of Fraenkel is present in a large proportion of the cases.

**History.**—The disease was known to Hippocrates and the old Greek physicians, by whom it was confounded with pleurisy. Among the ancients, Aretaeus gave a remarkable description. "Ruddy in countenance, but especially the cheeks; the white of the eyes very bright and fatty; the point of the nose flat; the veins in the temples and neck distended; loss of appetite; pulse, at first, large, empty, very frequent, as if forcibly accelerated; heat indeed, externally, feeble; and more humid than natural, but, internally, dry and very hot, by means of which the breath is hot; there is thirst, dryness of the tongue, desire of cold air, aberration of mind; cough mostly dry, but if anything be brought up it is a frothy phlegm, or slightly tinged with bile, or with a very florid tinge of blood. The blood-stained is of all others the worst." At the end of the seventeenth and the beginning of the eighteenth century Morgagni and Valsalva made many accurate clinical and anatomical observations on the disease. Our modern knowledge dates from Laennec (1819), whose masterly description of the physical signs and morbid anatomy left very little for subsequent observers to add or modify.

**Incidence.**—One of the most wide-spread and fatal of all acute diseases, pneumonia has become the "Captain of the Men of Death," to use the phrase applied by John Bunyan to consumption. In England and Wales in 1903 there were 40,725 deaths from this cause; 13,208 were attributed to lobar pneumonia, 17,425 to broncho-pneumonia, 10 to epidemic pneumonia, 216 to septic pneumonia, while 19,869 were registered as from pneumonia without further qualification. In 1902 there were 26,526 deaths from all forms of pneumonia, 21,623 in 1901, and 26,147 in 1900. The total number of deaths rose above 20,000 in 1890 and 1891 after the influenza, and fell again in 1894 to 18,000 (Tatham). The United States Census Report for 1900 gives 106.1 deaths from pneumonia per 1,000 deaths, against 90.6 in 1890 and 83.30 in 1880. An apparent increase is noted in the larger cities, particularly New York and Chicago. In Greater New York in 1904, out of a total of 42,700 deaths, there were 8,360 deaths from pneumonia, 19.5 per cent, against 16.5 per cent in 1903, 17 per cent in 1902, 16 per cent in 1901, and 14.7 per cent in 1898. In Chicago for the year 1903, out of a total of 28,914 deaths, 4,629, or 16 per cent, were from pneumonia, an increase of 18 per cent since the year 1900 (Reynolds).

**Etiology.**—**AGE.**—To the sixth year the predisposition to pneumonia is marked; it diminishes to the fifteenth year, but then for each subsequent decade it increases. For children Holt's statistics of 500 cases give: First year, 15 per cent; from the second to the sixth year, 62 per cent; from the seventh to the eleventh year, 21 per cent; from the twelfth to the fourteenth year, 2 per cent. Lobar pneumonia has been met with in the new-born. The relation to age is well shown in the last U. S. Census Report for 1900. The death-rate in persons from fifteen to forty-five years was 100.05 per 100,000 of population; from forty-five to sixty-five years it was 263.12; and in persons sixty-five years of age and over it was 733.77. Pneumonia may well be called the friend of the aged. Taken off by it in an acute, short, not often painful illness, the old man escapes those "cold gradations of decay" so distressing to himself and to his friends.

**SEX.**—Males are more frequently affected than females.

**RACE.**—In the United States pneumonia is more fatal in negroes than

among the whites. Among the former, at the Johns Hopkins Hospital, the mortality was rarely under 30 per cent, against an average of about 25 per cent in the latter.

**SOCIAL CONDITION.**—The disease is more common in the cities. Individuals who are much exposed to hardship and cold are particularly liable to the disease. Newcomers and immigrants are stated to be less susceptible than native inhabitants.

**PERSONAL CONDITION.**—Debilitating causes of all sorts render individuals more susceptible. Alcoholism is perhaps the most potent predisposing factor. Robust, healthy men are, however, often attacked.

**PREVIOUS ATTACK.**—No other acute disease recurs in the same individual with such frequency. Instances are on record of individuals who have had ten or more attacks. The percentage of recurrences has been placed as high as 50. Netter gives it as 31, and he has collected the statistics of eleven observers who place the percentage at 26.8. Among the highest figures for recurrences are those of Benjamin Rush, 28, and Andral, 16.

**TRAUMA—CONTUSION-PNEUMONIA.**—Pneumonia may follow directly upon injury, particularly of the chest, without necessarily any lesion of the lung. Litten gives 4.4 per cent, Stern 2.8 per cent. There have been several well-marked cases at the Johns Hopkins Hospital. Stern describes three clinical varieties: first, the ordinary lobar pneumonia following a contusion of the chest wall; secondly, atypical cases, with slight fever and not very characteristic physical signs; thirdly, cases with the physical signs and features of broncho-pneumonia. The last two varieties have a favorable prognosis. According to Ballard, workers in certain phosphate factories, where they breathe a very dusty atmosphere, are particularly prone to pneumonia.

Cold has been for years regarded as an important etiological factor. The frequent occurrence of an initial chill has been one reason for this wide-spread belief. As to the close association of pneumonia with exposure there can be no question. We see the disease occur either promptly after a wetting or a chilling due to some unusual exposure, or come on after an ordinary catarrh of one or two day's duration. Cold is now regarded simply as a factor in lowering the resistance of the bronchial and pulmonary tissues.

**CLIMATE AND SEASON.**—Climate does not appear to have very much influence, as pneumonia prevails equally in hot and cold countries. It is stated to be more prevalent in the Southern than in the Northern States, but an examination of the Census Reports shows that there is very little difference in the various state groups.

Much more important is the influence of *season*. Statistics are almost unanimous in placing the highest incidence of the disease in the winter and spring months. In Montreal, January, the coldest month of the year, but with steady temperature, has usually a comparatively low death-rate from pneumonia. The large statistics of Seitz from Munich and of Seibert of New York give the highest percentage in February and March.

**Bacteriology of Acute Lobar Pneumonia.**—(a) **MICROCOCCLUS LANCEOLATUS, PNEUMOCOCCUS OR DIPLOCOCCUS PNEUMONIZANS OF FRAENKEL AND WEICHELBAUM.**—In September, 1880, Sternberg inoculated rabbits with his own saliva and isolated a micrococcus. The publication was not made until April, 1881. Pasteur discovered the same organism in the saliva of a child dead

of hydrophobia in December, 1880, and the priority of the discovery belongs to him; as his publication is dated January, 1881. There was, however, no suspicion that this organism was concerned in the etiology of lobar pneumonia, and it was not really until April, 1884, that Fraenkel determined that the organism found by Sternberg and Pasteur in the saliva, and known as the coccus of sputum septicæmia, was the most frequent germ in pneumonia.

The organism is a somewhat elliptical, lance-shaped coccus, usually occurring in pairs; hence the term diplococcus. It is readily demonstrated in cover-glass preparations with the usual dyes and by the Gram method. About the organism in the sputum a capsule can always be demonstrated. Its cultural and biological properties present many variations, for a consideration of which the student is referred to the text-books on bacteriology. Scarcely any peculiarity is constant. A large number of varieties have been cultivated. Its kinship to *Streptococcus pyogenes* is regarded by many as very close, but the alkaline serum-water medium, containing inulin, recommended by His, serves to distinguish the pneumococcus from the streptococcus.

*Distribution in the Body.*—In the bronchial secretions and in the affected lung the pneumococcus is readily demonstrated in smears, and in the latter in sections. By using large quantities of blood (3 to 6 cc.) diluted over twelve times with a liquid culture medium, preferably broth, Kinsey was able to isolate the pneumococcus from the blood during life in 19 of 25 cases.

(b) PNEUMOCOCCUS UNDER OTHER CONDITIONS.—(1) *In the Mouth.*—The studies of the New York Pneumonia Commission have shown that the pneumococcus is present in the mouths of a large proportion of healthy individuals, the various observers giving 80 to 90 per cent of positive results. The virulence is not always uniform, and Langcope and Fox were able to show that the saliva of the same individual increased in virulence during the winter months. Some persons always harbor a virulent variety. Buerger at the Mt. Sinai Hospital studied the communicability of the organism from one person to another, and it was found repeatedly that normal individuals—i. e., persons in whose mouths the pneumococcus was proved by repeated examinations to be absent—acquired the organisms by association with cases of pneumonia, or with healthy persons in whose saliva pneumococci were present.

(2) *Outside the Body.*—The viability of the pneumococcus is not great. It has been found occasionally in the dust and sweepings of rooms, but Wood has shown (New York Commission Report) that the germs exposed to sunlight die in a very short time—an hour and a half being the limit. In moist sputum kept in a dark room the germs lived ten days, and in a badly ventilated room in which a person with pneumonia coughed, the germs suspended in the air retained their vitality for several hours.

(3) *The Pneumococcus in Other Diseases.*—The organism is very widely distributed, and occurs in many conditions other than croupous pneumonia. An acute septicæmia without local lesion may occur, resembling the typhoid septicæmia, already described. In a case reported by Townsend, a girl, aged six, had pain in the abdomen, vomiting, and a temperature of 104.2°. There was no exudate in the throat. She died thirty hours after the onset of the symptoms. There was found a general infection with the pneumococcus in blood, lungs, spleen, and kidneys. As Rosenau has shown, a bacteriæmia may precede the development of the local lesion in the lungs. In *terminal infec-*

tions the pneumococcus plays an important rôle. Flexner found it four times in acute peritonitis, eleven times in acute pericarditis, five times in acute endocarditis, and three times both in pleurisy and in acute meningitis.

The germ has been associated with wide-spread epidemics of catarrh of the upper air passages, *pneumococcus catarrh*, almost like influenza, and sometimes with gastro-intestinal disturbances.

An extraordinary number of local affections are due to the pneumococcus. It is a common cause of the primary and secondary *broncho-pneumonias*. Infection of the *accessory nasal sinuses* is most important. Darling found them involved in 92 per cent of all pneumococcus infections coming to autopsy at Panama. *Meningitis* may be associated with pneumonia or endocarditis, but the so-called primary pneumococcus meningitis is almost always secondary to sinus infection, 90 per cent in 25 cases (Darling). *Pericarditis*, *endocarditis*, *empyema*, *peritonitis*, *arthritis*, *conjunctivitis*, *otitis* may be primary infections with this ubiquitous germ.

(c) *BACILLUS PNEUMONIZ* OF FRIEDLÄNDER.—This is a larger organism than the pneumococcus, and appears in the form of plump, short rods. It also shows a capsule, but presents marked biological and cultural differences from Fraenkel's pneumococcus. It occurred in 9 of Weichselbaum's 129 cases. It may cause broncho-pneumonia and other affections, but probably is not a cause of genuine lobar pneumonia. The exudate in pneumonias caused by this bacillus is usually more viscid and poorer in fibrin than that in diplococcus pneumonias.

(d) OTHER ORGANISMS.—Various bacteria may be associated with the pneumococcus in lobar pneumonia, the most common of these being *Streptococcus pyogenes*, the pyogenic staphylococci, and Friedländer's pneumobacillus; but while these latter may cause broncho-pneumonias, they have not been satisfactorily demonstrated to be other than secondary invaders in lobar pneumonia. Likewise the pneumonias caused by *Bacillus typhosus*, *Bacillus diphtheria*, and the influenza bacillus are not to be identified with true lobar pneumonia.

Clinically, the *infectious nature* of pneumonia was recognized long before we knew anything of the pneumococcus. Among the features which favored this view were the following: First, the disease is similar to other infections in its mode of outbreak. It may occur in endemic form, localized in certain houses, in barracks, jails, and schools. As many as ten occupants of one house have been attacked. I have seen three members of a family consecutively attacked with a most malignant type of pneumonia. Among the more remarkable endemic outbreaks is that reported by W. B. Rodman, of Frankfort, Ky. In a prison with a population of 735 there occurred in one year 118 cases of pneumonia with 25 deaths. The disease may assume epidemic proportions. In the Middlesborough epidemic, so carefully studied by Ballard, there were 682 persons attacked, with a mortality of 21 per cent. During some years pneumonia is so prevalent that it is practically pandemic. Direct contagion is suggested by the fact that a patient in the next bed to a pneumonia case may take the disease, or 2 or 3 cases may follow in rapid succession in a ward. It is very exceptional, however, for nurses or doctors to be attacked.

Secondly, as in other acute infections, the constitutional symptoms may bear no proportion whatever to the severity of the local lesion. As is well

known, a patient may have a very small apex pneumonia which does not seriously impair the breathing capacity, but which may be accompanied with the most intense toxic features.

Thirdly, the clinical course of the disease is that of an acute infection. It is the very type of a self-limited disease, running a definite cycle in a way seen only in infectious disorders.

Conditions Favoring Infection.—Some have already been referred to, but of many we are still ignorant. The one all-important fact, emphasized by the work of the New York Commission, is that a majority of us harbor the germ in mouth or nose or throat. It has been shown that the virulence varies at different periods, and with this may be associated the well-known seasonal prevalence of the disease. Some individuals are less resistant, and in no other acute disease may so many successive attacks occur in the same person. It is notorious that the negro race in the United States, in Panama, and in South Africa shows an extreme susceptibility; on the other hand, the Chinese in the South African compounds show an extraordinary resistance to the disease (Porter). Probably for each one of us it is a battle between the degree of resistance and the virulence of the organism which we harbor. A catarrh of the upper air passages, exposure, alcoholism, etc., weaken the defences, and give the ever-present enemy a chance, either for a frontal attack in the lungs, in an acute pneumonia, or to make a flanking assault on some unprotected region, causing a peritonitis, otitis, sinusitis, etc.

Immunity and Serum Therapy.—The pneumococcus does not produce in artificial cultures any strong, soluble toxin analogous to the diphtheria toxin or the tetanus toxin, but its poison is contained within the bacterial cells, from which it may be extracted in various ways, or it may be set free from the dead or degenerated cocci. The possibility that the pneumococcus may secrete a soluble toxin in the infected human or animal body may be admitted, but of this there is no conclusive demonstration. By the use of living or dead pneumococci or their extracts, animals may be vaccinated against this organism, so that their blood-serum is capable of protecting susceptible animals against many times the minimal fatal dose of the virulent pneumococcus. Strong protective serum has thus been obtained from rabbits, horses, asses, cows, and other animals subjected to repeated inoculations with dead and living cultures of the pneumococcus. This specific serum is neither antitoxic nor bactericidal. Metchnikoff believes that it acts by stimulating the leucocytes to ingest and destroy the pneumococci, but A. E. Wright and Douglas have shown that the protective constituent, which they call an opsonin, enters into chemical combination with the cocci, rendering them thereby more readily engulfed and digested by the phagocytes. Neufeld and Rimpau have reached a similar conclusion as to the mode of action of this immune serum. M. Wassermann finds that the specific protective substances are formed in the bone-marrow, and thence distributed to the blood. There is evidence that similar specific substances are produced in human beings infected with this organism, and the crisis of pneumonia is explained by the formation and accumulation of these substances in the body.

Many trials have been made of the curative value of antipneumococcal serum in the treatment of pneumonia, the serum made by Pane having been most extensively employed. Thus far it has not been shown that this serum

influences in any marked degree the course of the disease in man. Pässler claims to have observed favorable results from the use of a polyvalent serum prepared according to a method devised by Römer; and he advocates its employment especially in patients with symptoms of severe infection.

**Morbid Anatomy.**—Since the time of Laennec, pathologists have recognized three stages in the inflamed lung: engorgement, red hepatization, and gray hepatization.

In the stage of *engorgement* the lung tissue is deep red in color, firmer to the touch, and more solid, and on section the surface is bathed with blood and serum. It still crepitates, though not so distinctly as healthy lung, and excised portions float. The air-cells can be dilated by insufflation from the bronchus. The capillary vessels are greatly distended, the alveolar epithelium swollen, and the air-cells occupied by a variable number of blood-corpuscles and detached alveolar cells. In the stage of *red hepatization* the lung tissue is solid, firm, and airless. If the entire lobe is involved it looks voluminous, and shows indentations of the ribs. On section, the surface is dry, reddish-brown in color, and has lost the deeply congested appearance of the first stage. One of the most remarkable features is the friability; in striking contrast to the healthy lung, which is torn with difficulty. The surface has a granular appearance due to the fibrinous plugs filling the air-cells. The distinctness of this appearance varies greatly with the size of the alveoli, which are about 0.10 mm. in diameter in the infant, 0.15 or 0.16 in the adult, and from 0.20 to 0.25 in old age. On scraping the surface with a knife a reddish viscid serum is removed, containing small granular masses. The smaller bronchi often contain fibrinous plugs. If the lung has been removed before the heart, it is not uncommon to find solid moulds of clot filling the blood-vessels. Microscopically, the air-cells are seen to be occupied by coagulated fibrin in the meshes of which are red blood-corpuscles, mononuclear and polynuclear leucocytes, and alveolar epithelium. The alveolar walls are infiltrated and leucocytes are seen in the interlobular tissues. Cover-glass preparations from the exudate, and thin sections show, as a rule, the diplococci already referred to, many of which are contained within cells. Staphylococci and streptococci may also be seen in some cases. In the stage of *gray hepatization* the tissue has changed from a reddish-brown to a grayish-white color. The surface is moister, the exudate obtained on scraping is more turbid, the granules in the acini are less distinct, and the lung tissue is still more friable. The air-cells are densely filled with leucocytes, the fibrin network and the red blood-corpuscles have largely disappeared. A more advanced condition of gray hepatization is that known as *purulent infiltration*, in which the lung tissue is softer and bathed with a purulent fluid. Small abscess cavities may form, and by their fusion larger ones, though this is a rare event in ordinary pneumonia.

**Resolution.**—The changes in the exudate which lead to its resolution are due to an autolytic digestion by proteolytic enzymes which are present much more abundantly in gray hepatization than in the preceding stage. The dissolved exudate is for the most part excreted by the kidneys. By following the nitrogen excess in the urine the progress of resolution may be followed and even an estimate formed of the amount of the exudate thus eliminated. In a study from my clinic H. W. Cook found in cases of delayed resolution that



the nitrogen excess in the urine (which persisted until the lung was clear) was very large, and he suggests that delayed resolution may really be a matter of continued exudation.

*General Details of the Morbid Anatomy.*—In 100 autopsies, made by me at the General Hospital, Montreal, in 51 cases the right lung was affected, in 32 the left, in 17 both organs. In 27 cases the entire lung, with the exception, perhaps, of a narrow margin at the apex and anterior border, was consolidated. In 34 cases, the lower lobe alone was involved; in 13 cases, the upper lobe alone. When double, the lower lobes were usually affected together, but in three instances the lower lobe of one and the upper lobe of the other were attacked. In 3 cases, also, both upper lobes were affected. Occasionally the disease involves the greater part of both lungs; thus, in one instance the left organ with the exception of the anterior border was uniformly hepatized, while the right was in the stage of gray hepatization, except a still smaller portion in the corresponding region. In a third of the cases, red and gray hepatization existed together. In 22 instances there was gray hepatization. As a rule the unaffected portion of the lung is congested or œdematous. When the greater portion of a lobe is attacked, the uninvolved part may be in a state of almost gelatinous œdema. The unaffected lung is usually congested, particularly at the posterior part. This, it must be remembered, may be largely due to post-mortem subsidence. The uninflamed portions are not always congested and œdematous. The upper lobe may be dry and bloodless when the lower lobe is uniformly consolidated. The average weight of a normal lung is about 600 grammes, while that of an inflamed organ may be 1,500, 2,000, or even 2,500 grammes.

The bronchi contain, as a rule, at the time of death a frothy serous fluid, rarely the tenacious mucus so characteristic of pneumonic sputum. The mucous membrane is usually reddened, rarely swollen. In the affected areas the smaller bronchi often contain fibrinous plugs, which may extend into the larger tubes, forming perfect casts. The bronchial glands are swollen and may even be soft and pulpy. The pleural surface of the inflamed lung is invariably involved when the process becomes superficial. Commonly, there is only a thin sheeting of exudate, producing slight turbidity of the membrane. In only two of the hundred instances the pleura was not involved. In some cases the fibrinous exudate may form a creamy layer an inch in thickness. A serous exudation of variable amount is not uncommon.

*Lesions in Other Organs.*—The heart, particularly its right chamber, is distended with firm, tenacious coagula, which can be withdrawn from the vessels as dendritic moulds. In no other acute disease do we meet with coagula of such solidity. The spleen is often enlarged, though in only 35 of the 100 cases was the weight above 200 grammes. The kidneys show parenchymatous swelling, turbidity of the cortex, and, in a very considerable proportion of the cases—25 per cent—chronic interstitial changes.

*Pericarditis* is not infrequent, and occurs more particularly with pneumonia of the left side and with double pneumonia. In 5 of the 100 autopsies it was present, and in 4 of them the lappet of lung overlying the pericardium with its pleura was involved. *Endocarditis* is more frequent and occurred in 16 of the 100 cases. In 5 of these the endocarditis was of the simple character; in 11 the lesions were ulcerative. Of 209 cases of malig-

nant endocarditis which I collected from the literature, 54 occurred in pneumonia. Kanthack found an antecedent pneumonia in 14.2 per cent of cases of infective endocarditis. In the recent figures collected by E. F. Wells, of 517 fatal cases of acute endocarditis, 22.3 per cent were in pneumonia. It is more common on the left than on the right side of the heart. Of 61 of a series of 107 cases of endocarditis in Professor Welch's laboratory in which cultures were made, pneumococci were found in 21. In 7 of the cases there was a general pneumococcic infection. *Myocarditis* and fatty degeneration of the heart may be present in protracted cases.

*Meningitis*, which is not infrequent, may be associated with malignant endocarditis. It was present in 8 of the 100 autopsies. Of 20 cases of meningitis in ulcerative endocarditis 15 occurred in pneumonia. The meningitis is usually of the convex.

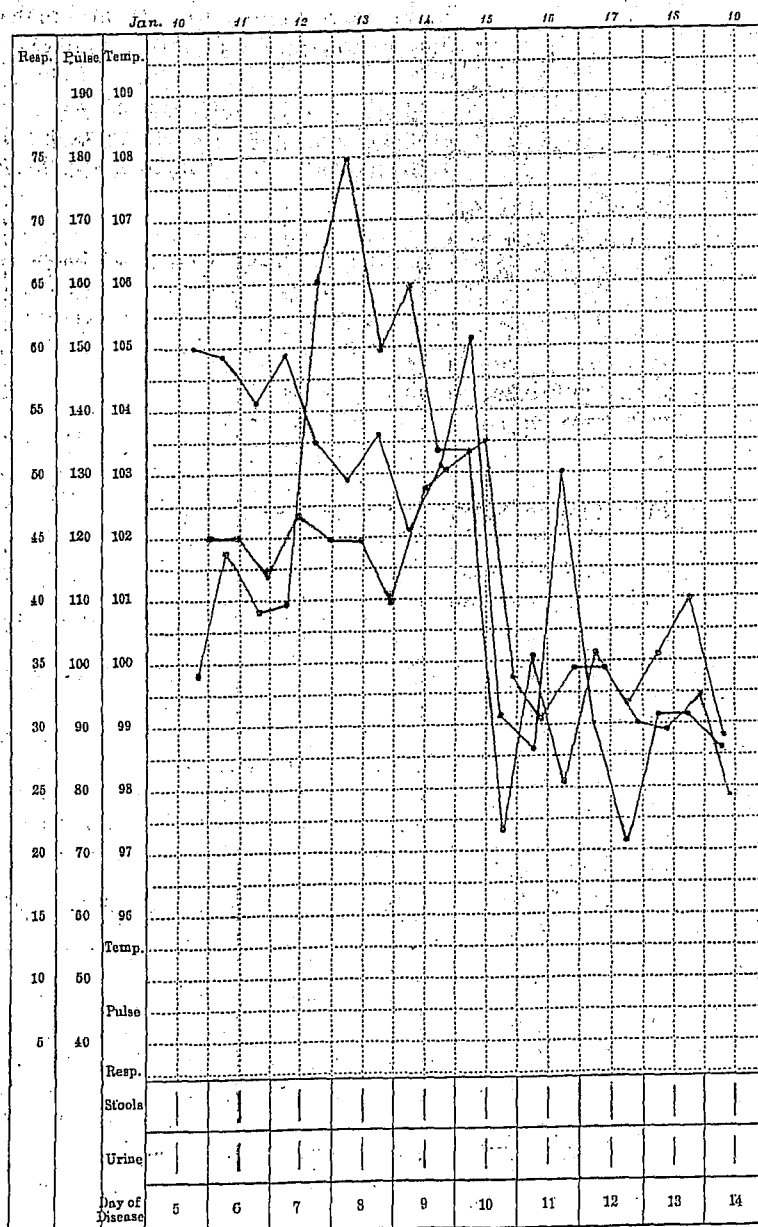
Croupous or diphtheritic inflammation may occur in other parts. A *croupous colitis*, as pointed out by Bristowe, is not very uncommon. It occurred in 5 of my 100 post mortems. It is usually a thin, flaky exudation, most marked on the tops of the folds of the mucous membrane. In one case there was a patch of *croupous gastritis*, covering an area 2 by 8 cm., situated to the left of the cardiac orifice.

The liver shows parenchymatous changes, and often extreme engorgement of the hepatic veins.

**Symptoms.—COURSE OF THE DISEASE IN TYPICAL CASES.**—We know but little of the incubation period in lobar pneumonia. It is probably very short. There are sometimes slight catarrhal symptoms for a day or two. As a rule, the disease sets in abruptly with a severe chill, which lasts from fifteen to thirty minutes or longer. In no acute disease is an initial chill so constant or so severe. The patient may be taken abruptly in the midst of his work, or may awaken out of a sound sleep in a rigor. The temperature taken during the chill shows that the fever has already begun. If seen shortly after the onset, the patient has usually features of an acute fever, and complains of headache and general pains. Within a few hours there is pain in the side, often of an agonizing character; a short, dry, painful cough begins, and the respirations are increased in frequency. When seen on the second or third day, the picture in typical pneumonia is more distinctive than that presented by any other acute disease. The patient lies flat in bed, often on the affected side; the face is flushed, particularly one or both cheeks; the breathing is hurried, accompanied often with a short expiratory grunt; the *alæ nasi* dilate with each inspiration; herpes is usually present on the lips or nose; the eyes are bright, the expression is anxious, and there is a frequent short cough which makes the patient wince and hold his side. The expectoration is blood-tinged and extremely tenacious. The temperature may be 104° or 105°. The pulse is full and bounding and the pulse-respiration ratio much disturbed. Examination of the lungs shows the physical signs of consolidation—blowing breathing and fine râles. After persisting for from seven to ten days the crisis occurs, and with a fall in the temperature the patient passes from the condition of extreme distress and anxiety to one of comparative comfort.

**Special Features.**—*The fever* rises rapidly, and the height may be 104° or 105° within twelve hours. Having reached the fastigium, it is remarkably

constant. Often the two-hour temperature chart will not show for two days more than a degree of variation. In children and in cases without chill the



BLACK, TEMPERATURE; RED, PULSE; BLUE, RESPIRATION.  
 CHART X.—FEVER, PULSE, AND RESPIRATION IN LOBAR PNEUMONIA.

rise is more gradual. In old persons and in drunkards the temperature range is lower than in children and in healthy individuals; indeed, one occasionally meets with an afebrile pneumonia.

**THE CRISIS.**—After the fever has persisted for from five to nine or ten days there is an abrupt drop, known as the crisis, which is one of the most characteristic features of the disease. The day of the crisis is variable. It is very uncommon before the third day, and rare after the twelfth. I have seen it as early as the third day. From the time of Hippocrates it has been thought to be more frequent on the uneven days, particularly the fifth and seventh. A *precritical rise* of a degree or two may occur. In one case the temperature rose from 105° to nearly 107°, and then in a few hours fell to normal. Not even after the chill in malarial fever do we see such a prompt and rapid drop in the temperature. The usual time is from five to twelve hours, but often in an hour there may occur a fall of six or eight degrees (S. West). The temperature may be subnormal after the crisis, as low as 96° or 97°. Usually there is an abundant sweat, and the patient sinks into a comfortable sleep. The day after the crisis there may be a slight post-critical rise. A *pseudo-crisis* is not very uncommon, in which on the fifth or sixth day the temperature drops from 104° or 105° to 102°, and then rises again. When the fall takes place gradually within twenty-four hours it is called a protracted crisis. If the fever persists beyond the twelfth day, the fall is likely to be by lysis. In children this mode of termination is common, and occurred in one-third of a series of 183 cases reported by Morrill. Occasionally in debilitated individuals the temperature drops rapidly just before death; more frequently there is an ante-mortem elevation. In cases of delayed resolution the fever may persist for six or eight weeks. The crisis is the most remarkable single phenomenon of pneumonia. With the fall in the fever the respirations become reduced almost to normal, the pulse slows, and the patient passes from perhaps a state of extreme hazard and distress to one of safety and comfort, and yet, so far as the physical examination indicates, there is with the crisis no special change in the local condition in the lung.

**PAIN.**—There is early a sharp, agonizing pain, generally referred to the region of the nipple or lower axilla of the affected side, and much aggravated on deep inspiration and on coughing. It is associated, as Aretæus remarks, with involvement of the pleura. It is absent in central pneumonia, and much less frequent in apex pneumonia. The pain may be severe enough to require a hypodermic injection of morphia. As has been recognized for many years, the pain may be altogether abdominal, either central or in the right iliac fossa, suggesting appendicitis. Crozer Griffith, calling attention to the frequency of the simulation in children, reports 8 cases, and has collected 34 cases from the literature, many in adults. The operation for appendicitis has been performed.

**DYSPNOEA** is an almost constant feature. Even early in the disease the respirations may be 30 in the minute, and on the second or third day between 40 and 50. The movements are shallow, evidently restrained, and if the patient is asked to draw a deep breath he cries out with the pain. Expiration is frequently interrupted by an audible grunt. At first with the increased respiration there may be no sensation of distress. Later this may be present in a marked degree. In children the respirations may be 80 or even 100. Many factors combine to produce the shortness of breath—the pain in the side, the toxæmia, the fever, and the loss of function in a considerable area of the lung tissue. Sometimes there appear to be nervous factors at work.

That it does not depend upon the consolidation is shown by the fact that after the crisis, without any change in the local condition of the lung, the number of respirations may drop to normal. The ratio between the respirations and the pulse may be 1 to 2 or even 1 to 1.5, a disturbance rarely so marked in any other disease.

**COUGH.**—This usually comes on with the pain in the side, and at first is dry, hard, and without any expectoration. Later it becomes very characteristic—frequent, short, restrained, and associated with great pain in the side. In old persons, in drunkards, in the terminal pneumonias, and sometimes in young children, there may be no cough. After the crisis the cough usually becomes much easier and the expectoration more easily expelled. The cough is sometimes persistent, continuous, and by far the most aggravated and distressing symptom of the disease. Paroxysms of coughing of great intensity after the crisis suggest a pleural exudate.

**SPUTUM.**—A brisk hæmoptysis may be the initial symptom. At first the sputum may be mucoid, but usually after twenty-four hours it becomes blood-tinged, viscid, and very tenacious. At first quite red from the unchanged blood, it gradually becomes rusty or of an orange yellow. The tenacious viscosity of the sputum is remarkable; it often has to be wiped from the lips of the patient. When jaundice is present it may be green or yellow. In low types of the disease the sputum may be fluid and of a dark brown color, resembling prune juice. The amount is very variable, ranging from 100 to 300 cc. in the twenty-four hours. In 100 cases in my clinic studied by Emerson, in 16 there was little or no sputum; in 32 it was typically rusty; in 33 blood-streaked; in 3 cases the sputum was very bloody. In children and very old people there may be no sputum whatever. After the crisis the quantity is variable, abundant in some cases, absent in others.

Microscopically, the sputum consists of leucocytes, mucus corpuscles, red blood-corpuscles in all stages of degeneration, and bronchial and alveolar epithelium. Hæmatoidin crystals are occasionally met with. Of micro-organisms the pneumococcus is usually present, and sometimes Friedländer's bacillus and the influenza bacillus. Very interesting constituents are small cell moulds of the alveoli and the fibrinous casts of the bronchioles; the latter may be very plainly visible to the naked eye, and sometimes may form good-sized dendritic casts. Chemically, the expectoration is particularly rich in calcium chloride.

**Physical Signs.—INSPECTION.**—The position of the patient is not constant. He usually rests more comfortably on the affected side, or he is propped up with the spine curved toward it. Orthopnea is rare.

In a small lesion no differences may be noted between the sides; as a rule, movement is much less on the affected side, which may look larger. With involvement of a lower lobe, the apex on the same side may show greater movement. The compensatory increased movement on the sound side is sometimes very noticeable even before the patient's chest is bared. The intercostal spaces are not usually obliterated. When the cardiac lappet of the left upper lobe is involved there may be a marked increase in the area of visible cardiac pulsation. Pulsation of the affected lung may cause a marked movement of the chest wall (Graves). Other points to be noticed in the inspection are the frequency of the respiration, the action of the accessory muscles, such as the

sterno-cleido-mastoids and scaleni, and the dilatation of the nostrils with each inspiration.

MENSURATION may show a definite increase in the volume of the side affected, rarely more, however, than 1 or 1½ cm.

PALPATION.—The lack of expansion on the affected side is sometimes more readily perceived by touch than by sight. The pleural friction may be felt. On asking the patient to count, the voice fremitus is greatly increased in comparison with the corresponding point on the healthy side. It is to be remembered that if the bronchi are filled with thick secretion, or if, in what is known as massive pneumonia, they are filled with fibrinous exudate, the tactile fremitus may be diminished. It is always well to ask the patient to cough before testing the fremitus.

PERCUSSION.—In the stage of engorgement the note is higher pitched and may have a somewhat tympanitic quality, the so-called Skoda's resonance. This can often be obtained over the lung tissue just above a consolidated area. L. A. Conner calls attention to a point which all observers must have noticed, that, when the patient is lying on his side, the percussion at the dependent base is "deeper and more resonant than that of the upper side," which by contrast may seem abnormal, and there may even be a faint tubular element added to the vesicular breathing on the compressed side. When the lung is hepatized, the percussion note is dull, the quality varying a good deal from a note which has in it a certain tympanitic quality to one of absolute flatness. There is not the wooden flatness of effusion and the sense of resistance is not so great. During resolution the tympanitic quality of the percussion note usually returns. For weeks or months after convalescence there may be a higher-pitched note on the affected side. Wintrich's change in the percussion note when the mouth is open may be very well marked in pneumonia of the upper lobe. Occasionally there is an almost metallic quality over the consolidated area, and when this exists with a very pronounced amphoric quality in the breathing the presence of a cavity may be suggested. In deep-seated pneumonias there may be for several days no change in the percussion note.

AUSCULTATION.—Quiet, suppressed breathing in the affected part is often a marked feature in the early stage, and is always suggestive. Only in a few cases is the breathing harsh or puerile. Very early there is heard at the end of inspiration the fine crepitant r le, a series of minute cracklings heard close to the ear, and perhaps not audible until a full breath is drawn. This is probably a fine pleural crepitus, as J. B. Leaming maintained; it is usually believed to be produced in the air-cells and finer bronchi by the separation of the sticky exudate. In the stage of red hepatization and when dullness is well defined, the respiration is tubular, similar to that heard in health over the larger bronchi. It is heard first with expiration (a point noted by James Jackson, Jr.), and is soft and of low pitch. Gradually it becomes more intense, and finally presents an intensity unknown in any other pulmonary affection—of high pitch, perfectly dry, and of equal length with inspiration and expiration. It is simply the propagation of the laryngeal and tracheal sounds through the bronchi and the consolidated lung tissue. The permeability of the bronchi is essential to its production. Tubular breathing is absent in the excessively rare cases of massive pneumonia in which the larger bronchi are completely filled with exudation. When resolution begins mucous r les

of all sizes can be heard. At first they are small and have been called the *redus-crepitus*. The voice-sounds and the expiratory grunt are transmitted through the consolidated lung with great intensity. This bronchophony may have a curious nasal quality, to which the term *egophony* has been given. There are cases in which the consolidation is deeply seated—so-called central pneumonia, in which the physical signs are slight or even absent, yet the cough, the rusty expectoration, and general features make the diagnosis certain.

**Circulatory Symptoms.**—During the chill the *pulse* is small, but in the succeeding fever it becomes full and bounding. In cases of moderate severity it ranges from 100 to 116. It is not often dicrotic. In strong, healthy individuals and in children there may be no sign of failing pulse throughout the attack. With extensive consolidation the left ventricle may receive a very much diminished amount of blood and the pulse in consequence may be small. In the old and feeble it may be small and rapid from the outset. The pulse may be full, soft, very deceptive, and of no value whatever in prognosis.

**BLOOD PRESSURE.**—During the first few days there is no change. The extent of involvement seems to have no effect upon the peripheral blood pressure. In the toxic cases the pressure may begin to fall early; a drop of 15–20 mm. Hg. is perfectly safe, but a progressive fall indicates the need of stimulation. A sudden drop is rarely seen except just before death. A slow, gradual fall of more than 20 mm. Hg. means cardio-vascular asthenia, and calls for an increase in the stimulation. The crisis has no effect on the blood pressure. The *heart-sounds* are usually loud and clear. During the intensity of the fever, particularly in children, *bruits* are not uncommon both in the mitral and in the pulmonic areas. The second sound over the pulmonary artery is accentuated. Attention to this sign gives a valuable indication as to the condition of the lesser circulation. With distention of the right chambers and failure of the right ventricle to empty itself completely the pulmonary second sound becomes much less distinct. When the right heart is engorged there may be an increase in the dulness to the right of the sternum. With gradual heart weakness and signs of dilatation the long pause is greatly shortened, the sounds approach each other in tone and have a foetal character (*embryocardia*).

There may be a sudden early collapse of the heart with very feeble, rapid pulse and increasing cyanosis. I have known this to occur on the third day. Even when these symptoms are very serious recovery may take place. In other instances without any special warning death may occur even in robust, previously healthy men. The heart weakness may be due to paralysis of the vaso-motor centre and consequent lowering of the general arterial pressure. The soft, easily compressed pulse, with the gray, ashy facies, cold hands and feet, the clammy perspiration, and the progressive prostration tell of a toxic action on the vaso-motor centres. Endocarditis and pericarditis will be considered under complications.

**BLOOD.**—Anæmia is rarely seen. Bollinger has called attention to an oligæmia due to the large amount of exudate. A decrease in the red cells may occur at the time of the crisis. There is in most cases a leucocytosis, which appears early, persists, and disappears with the crisis. The leucocytes may

number from 12,000 to 40,000 or even 100,000 per cubic millimetre. The fall in the leucocytes is often slower than the drop in the fever, particularly when resolution is delayed. The annexed chart shows well the coincident drop in the fever and in the number of the leucocytes. The leucocytosis bears relation to the extent of the exudate. In malignant pneumonia the leucocy-

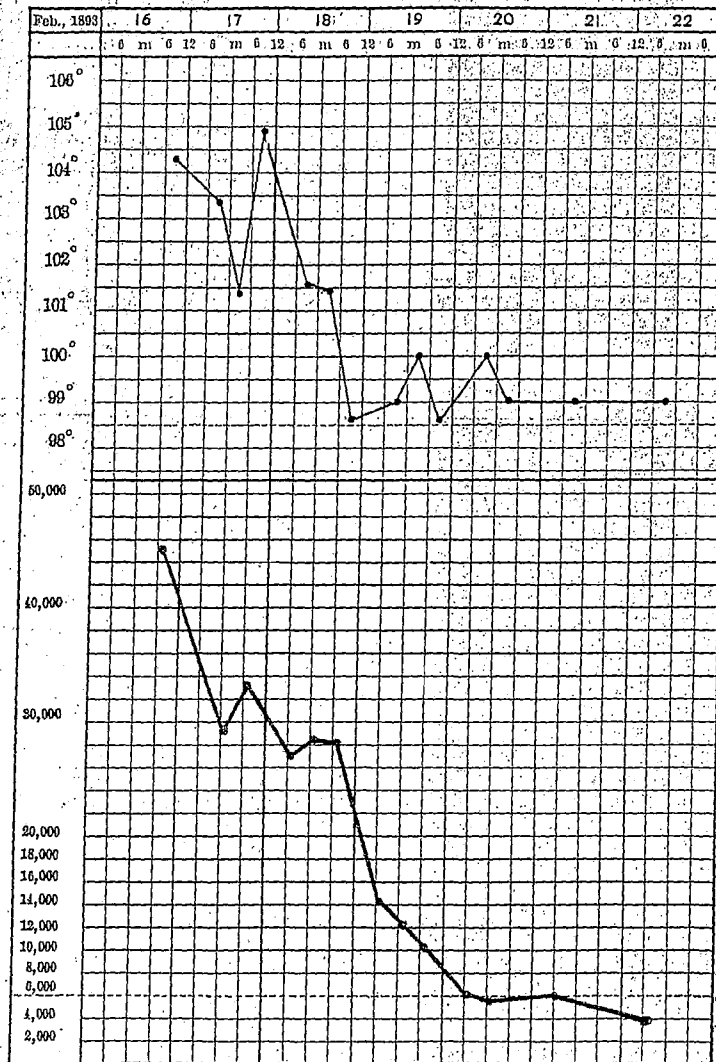


CHART XI.

tosis may be absent, and in any case the continuous absence may be regarded as an unfavorable sign. A striking feature in the blood-slide is the richness and density of the fibrin network. This corresponds to the great increase in the fibrin elements, the proportion rising from 4 to 10 parts per thousand. The blood-plates are greatly increased.



**Digestive Organs.**—The tongue is white and furred, and in severe toxic cases rapidly becomes dry. Vomiting is not uncommon at the onset in children. The appetite is lost. Constipation is more common than diarrhoea. A distressing and sometimes dangerous symptom is meteorism. Fibrinous, pneumococcic exudates may occur in the conjunctivæ, nose, mouth, prepuce, and anus (Cary). The liver may be depressed by the large right lung, or enlarged from the engorged right heart, or as a result of the infection. The spleen is usually enlarged, and the edge can be felt during a deep inspiration.

**Skin.**—Among *cutaneous* symptoms one of the most interesting is the association of herpes with pneumonia. Not excepting malaria, we see labial herpes more frequently in this than in any other disease, occurring, as it does, in from 12 to 40 per cent of the cases. It is supposed to be of favorable prognosis, and figures have been quoted in proof of this assertion. It may also occur on the nose, genitals, and anus. Its significance and relation to the disease are unknown. At the height of the disease sweats are not common, but at the crisis they may be profuse. Redness of one cheek is a phenomenon long recognized in connection with pneumonia, and is usually on the same side as the disease. A diffuse erythema is occasionally seen, and in rare cases purpura. Jaundice is referred to among the complications.

**Urine.**—Early in the disease it presents the usual febrile characters of high color, high specific gravity, and increased acidity. A trace of albumin is very common. There may be tube-casts, and in a few instances the existence of albumin, tube-casts, and blood indicates the presence of an acute nephritis. The urea and uric acid are usually increased at first, but may be much diminished before the crisis, to increase greatly with its onset. Robert Hutchison's researches show that a true retention of chlorides within the body takes place, the average amount being about 2 grams daily. It is a more constant feature of pneumonia than of any other febrile disease, and this being the case, a diminution of the chlorides in the urine may be of value in the diagnosis from pleurisy with effusion or empyema. It is to be remembered that in dilatation of the stomach chlorides may be absent. Hæmaturia is a rare complication.

**Cerebral Symptoms.**—Headache is common. In children convulsions occur frequently at the outset. Apart from meningitis, which will be considered separately, one may group the cases with marked cerebral features into—

First, the so-called cerebral pneumonias of children, in which the disease sets in with a convulsion, and there are high fever, headache, delirium, great irritability, muscular tremor, and perhaps retraction of the head and neck. The diagnosis of meningitis is usually made, and the local affection may be overlooked.

Secondly, the cases with maniacal symptoms. These may occur at the very outset, and I once performed an autopsy on a case in which there was no suspicion whatever that the disease was other than acute mania. The house physician should give instructions to the nurses to watch such cases very carefully. On March 22, 1894, a patient who had been doing very well, with the exception of slight delirium, while the orderly was out of the room for a few moments, got up, raised the window, and jumped out, sustaining a fracture of the leg and of the upper lumbar vertebrae, of which he died.

Thirdly, alcoholic cases with the features of delirium tremens. It should

be an invariable rule, even if fever be not present, to examine the lungs in a case of *mania a potu*.

Fourthly, cases with toxic features, resembling rather those of uræmia. Without a chill and without cough or pain in the side, a patient may have fever, a little shortness of breath, and then gradually grow dull mentally, and within three days be in a condition of profound toxæmia with low, muttering delirium.

It is stated that apex pneumonia is more often accompanied with severe delirium. Occasionally the cerebral symptoms occur immediately after the crisis. Mental disturbance may persist during and after convalescence, and in a few instances delusional insanity follows, the outlook in which is favorable.

Complications.—Compared with typhoid fever, pneumonia has but few complications and still fewer sequelæ. The most important are the following:

*Pleurisy* is an inevitable event when the inflammation reaches the surface of the lung, and thus can scarcely be termed a complication. But there are cases in which the pleuritic features take the first place—cases to which the term pleuro-pneumonia is applicable. The exudation may be sero-fibrinous with copious effusion, differing from that of an ordinary acute pleurisy in the greater richness of the fibrin, which may form thick, tenacious, curdy layers. Pneumonia on one side with extensive pleurisy on the other is sometimes a puzzling complication to diagnose, and an aspirator needle may be required to settle the question. *Empyema* is one of the most common complications, and has of late increased in frequency. During the eight years, 1883–90, there were at Guy's Hospital 7 cases of empyema among 445 cases of pneumonia, while in the eight years, 1891–98, there were 38 cases among 896 cases of pneumonia (Hale White). Influenza may be responsible for the increase. The pneumococcus is usually present; in a few the streptococcus, in which case the prognosis is not so good. Recurrence of the fever after the crisis or persistence of it after the tenth day, with sweats, leucocytosis, and perhaps an aggravation of the cough, are suspicious symptoms. The dulness persists at the base, or may extend. The breathing is feeble and there are no râles. Such a condition may be closely simulated, of course, by the thickened pleura. Exploratory aspiration may settle the question at once. There are obscure cases in which the pus has been found only after operation, as the collection may be very small.

*Pericarditis* was present in 31 of 665 patients in my wards at the Johns Hopkins Hospital (Chatard). It is often a terminal affair and overlooked. The mortality is very high; 29 of the 31 cases died. Pleurisy is an almost constant accompaniment, being present in 28 of the 29 autopsies in our series. In only 3 cases was the effusion purulent and in large amount.

*Endocarditis*.—The valves on the left side are more commonly attacked, and particularly if the seat of arterio-sclerosis. It is particularly liable to attack persons with old valvular disease. There may be no symptoms indicative of this complication even in very severe cases. It may, however, be suspected in cases (1) in which the fever is protracted and irregular; (2) when signs of septic mischief arise, such as chills and sweats; (3) when embolic phenomena appear. The frequent complication of meningitis with

the endocarditis of pneumonia, which has already been mentioned, gives prominence to the cerebral symptoms in these cases. The physical signs may be very deceptive. There are instances in which no cardiac murmurs have been heard. In others the occurrence under observation of a loud, rough murmur, particularly if diastolic, is extremely suggestive.

*Thrombosis*.—Ante-mortem clotting in the heart, upon which the old writers laid great stress, is very rare. Thrombosis in the peripheral veins is also uncommon. Two cases occurred at my clinic, which have been reported by Steiner, who was able to collect only 41 cases from the literature. In 27 out of 32 cases which were fully reported, the thrombosis occurred during convalescence. It is almost always in the femoral veins. A rare complication is *embolism* of one of the larger arteries. I saw in Montreal an instance of embolism of the femoral artery at the height of pneumonia, which necessitated amputation at the thigh. The patient recovered. *Aphasia* has been met with in a few instances, setting in abruptly with or without hemiplegia.

*Meningitis* is perhaps the most serious complication of pneumonia. It varies very much at different times and in different regions. My Montreal experience is rather exceptional, as 8 per cent of the fatal cases had this complication. It usually comes on at the height of the fever, and in the majority of the cases is not recognized unless, as before mentioned, the base is involved, which is not common. Occurring later in the disease, it is more easily diagnosed. In some cases it is associated with infective endocarditis. The pneumococcus has been found in the exudate.

*Peripheral neuritis* is a rare complication, of which several cases have been described.

*Gastric complications* are rare. A croupous gastritis has already been mentioned. The *croupous colitis* may induce severe diarrhoea.

*Abdominal Pain*.—It is by no means uncommon to have early pain, either in the region of the umbilicus or in the right iliac fossa, and a suspicion of appendicitis is aroused; indeed, a catarrhal form of this disease may occur coincidentally with the pneumonia. In other instances so localized may the pain be in the region of the pancreas, associated with meteorism and high fever; that the diagnosis of acute hæmorrhagic pancreatitis is made. Such a case occurred in February, 1905, in the wards of my colleague Dr. Halsted. The patient was admitted in a desperate condition, all the symptoms were abdominal, and the apex pneumonia was not discovered. *Peritonitis* is a rare complication, of which we have had only two or three instances. It is sometimes in the upper peritonæum, and a direct extension through the diaphragm. It is usually in the severer cases and not easy to recognize. In one case, indeed, in which there was a friction along the costal border, which we thought indicated a peritonitis, it was communicated from the diaphragmatic pleura. Meteorism is not infrequent, and is sometimes serious. In some cases it may be due to a defect in the mechanical action of the diaphragm, in others to an acute septic catarrh of the bowels, or to a toxic paresis of the walls, occasionally to peritonitis. *Jaundice* occurs with curious irregularity in different outbreaks of the disease. In Baltimore it was more common among the negro patients. It sets in early, is rarely very intense, and has not the characters of obstructive jaundice. There are cases in which it assumes a very serious form. The mode of production is not well ascertained. It does not appear

to bear any definite relation to the degree of hepatic engorgement, and it is not always due to catarrh of the ducts. Possibly it may be, in great part, hæmatogenous.

*Parotitis* occasionally occurs, commonly in association with endocarditis. In children, middle-ear disease is not an infrequent complication.

*Bright's disease* does not often follow pneumonia.

The relations of arthritis and pneumonia are very interesting. It may precede the onset, and the pneumonia, possibly with endocarditis and pleurisy, may occur as complications. In other instances at the height of an ordinary pneumonia one or two joints may become red and sore. On the other hand, after the crisis has occurred pains and swelling may come on in the joints.

**Relapse.**—There are cases in which from the ninth to the eleventh day the fever subsides, and after the temperature has been normal for a day or two a rise occurs and fever may persist for another ten days or even two weeks. Though this might be termed a relapse, it is more correct to regard it as an instance of an anomalous course of delayed resolution. Wagner, who has studied the subject carefully, says that in his large experience of 1,100 cases he met with only 3 doubtful cases. When it does occur, the attack is usually abortive and mild. In the case of Z. R. (Medical No. J. H. H., 4223), with pneumonia of the right lower lobe, crisis occurred on the seventh day, and after a normal temperature for thirteen days he was discharged. That night he had a shaking chill, followed by fever, and he had recurring chills with reappearance of the pneumonia. In a second case (Medical No. J. H. H., 4538) crisis occurred on the third day, and there was recurrence of pneumonia on the thirteenth day.

**Recurrence** is more common in pneumonia than in any other acute disease. Rush gives an instance in which there were 28 attacks. Other authorities narrate cases of 8, 10, and even more attacks.

**Convalescence** in pneumonia is usually rapid, and sequelæ are rare. After the crisis, sudden death has occurred when the patient has got up too soon. With the onset of fever and persistence of the leucocytosis the affected side should be very carefully examined for pleurisy. With a persistence of the dulness the physical signs may be obscure, but the use of a small exploratory needle will help to clear the diagnosis.

**Clinical Varieties.**—Local variations are responsible for some of the most marked deviations from the usual type.

*Apex pneumonia* is said to be more often associated with adynamic features and with marked cerebral symptoms. The expectoration and cough may be slight.

*Migratory or creeping pneumonia*, a form which successively involves one lobe after the other.

*Double pneumonia* has no peculiarities other than the greater danger connected with it.

*Massive pneumonia* is a rare form, in which not alone the air-cells but the bronchi of an entire lobe or even of a lung are filled with the fibrinous exudate. The auscultatory signs are absent; there is neither fremitus nor tubular breathing, and on percussion the lung is absolutely flat. It closely resembles pleurisy with effusion. The moulds of the bronchi may be expectorated in violent fits of coughing.

*Central Pneumonia.*—The inflammation may be deep-seated at the root of the lung or centrally placed in a lobe, and for several days the diagnosis may be in doubt. It may not be until the third or fourth day that a pleural friction is detected, or that dulness or blowing breathing and râles are recognized. I saw in 1898 with Drs. H. Adler and Chew a young, thin-chested girl in whom at the end of the fourth day all the usual symptoms of pneumonia were present without any physical signs other than a few clicking râles at the left apex behind. The thinness of the patient greatly facilitated the examination. The general features of pneumonia continued, and the crisis occurred on the seventh day.

*PNEUMONIA IN INFANTS.*—It is sometimes seen in the new-born. In infants it very often sets in with a convulsion. The apex of the lung seems more frequently involved than in adults, and the cerebral symptoms are more marked. The torpor and coma, particularly if they follow convulsions, and the preliminary stage of excitement, may lead to the diagnosis of meningitis. Pneumonic sputum is rarely seen in children.

*PNEUMONIA IN THE AGED.*—The disease may be latent and set in without a chill; the cough and expectoration are slight, the physical signs ill-defined and changeable, and the constitutional symptoms out of all proportion to the extent of the local lesion.

*PNEUMONIA IN ALCOHOLIC SUBJECTS.*—The onset is insidious, the symptoms masked, the fever slight, and the clinical picture usually that of delirium tremens. The thermometer alone may indicate the presence of an acute disease. Often the local condition is overlooked, as the patient makes no complaint of pain, and there may be very little shortness of breath, no cough, and no sputum.

*TERMINAL PNEUMONIA.*—The wards and the post-mortem room show a very striking contrast in their pneumonia statistics, owing to the occurrence of what may be called terminal pneumonia. During the winter months patients with chronic pulmonary tuberculosis, arterio-sclerosis, heart disease, Bright's disease, and diabetes are not infrequently carried off by a pneumonia which may give few or no signs of its presence. There may be a slight elevation of temperature, with increase in the respirations, but the patient is near the end and perhaps not in a condition in which a thorough physical examination can be made. The autopsy may show pneumonia of the greater part of one lower lobe or of the apex, which had entirely escaped notice. In diabetic patients the disease often runs a rapid and severe course, and may end in abscess or gangrene.

Some of the most remarkable variations in the clinical course of pneumonia depend probably upon the severity, possibly upon the nature of the infection. Further investigation may enable us to say how far the associated organisms, so often present, may be responsible for the differences in the clinical course.

*SECONDARY PNEUMONIAS.*—These are met with chiefly in the specific fevers, particularly diphtheria, typhoid fever, typhus, influenza, and the plague. Anatomically, they rarely present the typical form of red or gray hepatization. The surface is smoother, not so dry, and it is often a pseudo-lobar condition, a consolidation caused by closely set areas of lobular involvement. Histologically, they are characterized in many instances by a more

cellular, less fibrinous exudate, which may also infiltrate the alveolar walls. Bacteriologically, a large number of different organisms have been found, the specific microbe of the primary disease, usually in association with the streptococcus pyogenes or the staphylococcus; in some instances the colon bacillus has been present.

The symptoms of the secondary pneumonias often lack the striking definiteness of the primary croupous pneumonia. The pulmonary features may be latent or masked altogether. There may be no cough and only a slight increase in the number of respirations. The lower lobe of one lung is most commonly involved, and the physical signs are obscure and rarely amount to more than impaired resonance, feeble breathing, and a few crackling râles.

EPIDEMIC PNEUMONIA has already been referred to. It is, as a rule, more fatal, and often displays minor complications which differ in different outbreaks. In some the cerebral manifestations are very marked; in others, the cardiac; in others again, the gastro-intestinal.

LARVAL PNEUMONIA.—Mild, abortive types are seen, particularly in institutions when pneumonia is prevailing extensively. A patient may have the initial symptoms of the disease, a slight chill, moderate fever, a few indefinite local signs, and herpes. The whole process may only last for two or three days; some authors recognize even a one-day pneumonia.

ASTHENIC, TOXIC, OR TYPHOID PNEUMONIA.—The toxæmic features dominate the scene throughout. The local lesions may be slight in extent and the subjective phenomena of the disease absent. The nervous symptoms usually predominate. There are delirium, prostration, and early weakness. Very frequently there is jaundice. Gastro-intestinal symptoms may be present, particularly diarrhoea and meteorism. In such a case, seen about the end of the first week, it may be difficult to say whether the condition is one of asthenic pneumonia or one of typhoid fever which has set in with early localization in the lung. Here the Widal reaction and cultures from the blood are important aids. In these cases there is really a pneumococcus septicæmia, and the organisms may sometimes be isolated from the blood. Possibly, too, there is a mixed infection, and the streptococcus pyogenes may be in large part responsible for the toxic features of the disease.

ASSOCIATION OF PNEUMONIA WITH OTHER DISEASES.—(a) *With Malaria.*—A malarial pneumonia is described by many observers and thought to be particularly prevalent in some parts of the United States. One hears of it, indeed, even where true malaria is rarely seen. With our large experience in malaria, amounting now to between two and three thousand cases, and a considerable number of pneumonia patients every year, we have only had a few cases in which the latter disease has set in during malarial fever, or *vice versa*. In either case the malaria yields promptly to the action of quinine. A special form of pneumonia due to the malarial parasite is unknown. Yet there are cases reported by Craig and others in which in an acute malarial infection the features suggest pneumonia at the onset, but the parasites are found in the blood, and under the use of quinine the fever drops rapidly and the pneumonia symptoms clear up. Such a case as the following we see occasionally: A patient was admitted, March 16, 1894, with tertian malarial fever. The lungs were clear. A pneumonia began thirty-six hours after admission. Quinine was given that evening, and the malarial organisms rapidly disap-

peared from the blood. There was successive involvement of the right lower, the middle, and the left lower lobe. The temperature fell by crisis on the 24th, and there were no features in the disease whatever suggestive of malaria. In other instances we have found a chill in the course of an ordinary pneumonia to be associated with a malarial infection, and quinine has rapidly and promptly caused the disappearance of the parasites from the blood.

(b) *Pneumonia and Acute Arthritis*.—We have already spoken under complications of this association, which is more frequently seen in children.

(c) *Pneumonia and Tuberculosis*.—Many subjects of chronic pulmonary tuberculosis die of an acute croupous pneumonia. A point to be specially borne in mind is the fact that acute tuberculous pneumonia may set in with all the features and physical signs of fibrinous pneumonia (see page 175).

For the consideration of the association of pneumonia with typhoid fever and influenza, the reader is referred to the sections on those diseases.

**POST-OPERATION PNEUMONIA.**—Before the days of anaesthesia, lobar pneumonia was a well-recognized cause of death after surgical injuries and operations. Norman Cheevers, in an early number of the *Guy's Hospital Reports*, calls attention to it as one of the most frequent causes of death after surgical procedures, and Erichsen states that of 41 deaths after surgical injuries 23 cases showed signs of pneumonia. The lobular form is the most frequent. I have already referred to the contusion-pneumonia described by Litten.

**ETHER PNEUMONIA.**—The question of a direct relation between ether narcosis and pneumonia has been much discussed of late years, having been raised by Mr. Lucas, of *Guy's Hospital*. The statistics are by no means unanimous. The London anaesthetists, particularly Hewitt and Silk, seem to have had a fortunate experience, Silk having found among 5,000 cases 13 of pneumonia; 8 of these were tongue or jaw cases. The German experience is very different. Von Beck states that, owing to the injurious after-effects upon the respiratory tract, the use of ether has been largely restricted in Czerny's clinic. Gurlt reports 52,177 cases, with 30 cases of pneumonia and 15 deaths. We usually had three or four cases each year at the *Johns Hopkins Hospital*. Czerny suggests that the relation of these ether pneumonias to abdominal operations is associated with the pain on coughing, which leads to an accumulation of secretion, and through this to retention or aspiration pneumonia. Among the various views brought forward to account for it are the rapid evaporation of the ether, causing chilling of the pulmonary tissues, chilling of the patient at the time of operation, infection from the inhaler, and direct action of the ether.

The probability is that the prolonged etherization lowers the vitality of the tissues of the finer bronchi and permits the pathogenic organisms (which are almost always present) to do their work. The pneumonia is more frequently lobular than lobar. Neuwerck, and subsequently Whitney, have suggested thorough disinfection of the mouth and throat before operation.

**DELAYED RESOLUTION IN PNEUMONIA.**—The lung is restored to its normal state by the liquefaction and absorption of the exudate. There are cases in which resolution takes place rapidly without any increase in (or, indeed, without any) expectoration; on the other hand, during resolution it is not uncommon to find in the sputa the little plugs of fibrin and leucocytes

which have been loosened from the air-cells and expelled by coughing. A variable time is taken in the restoration of the lung. Sometimes within a week or ten days the dulness is greatly diminished, the breath-sounds become clear, and, so far as physical signs are any guide, the lung seems perfectly restored. It is to be remembered that in any case of pneumonia with extensive pleurisy a certain amount of dulness will persist for months, owing to thickening of the pleura.

Delayed resolution is a condition which causes much anxiety to the physician. While it is perhaps more frequent in debilitated persons, yet it is met with in robust, previously healthy individuals, and in cases which have had a very typical onset and course. The condition is stated to be most frequent in apex pneumonia. Venesection has been assigned as a cause. The solid exudate may persist for weeks and yet the integrity of the lung may ultimately be restored. Grissolè describes the lung from a patient who died on the sixtieth day, in which the affected part showed a condition not unlike that of the acute stage.

Clinically, there are several groups of cases: First, those in which the crisis occurs naturally, the temperature falls and remains normal, but the local features persist—well-marked flatness with tubular breathing and râles. Resolution may occur very slowly and gradually, taking from two to three weeks. In a second group of cases the temperature falls by lysis, and with the persistence of the local signs there is slight fever, sometimes sweats and rapid pulse. The condition may persist for three or four weeks, or, as in one of my cases, for eleven weeks, and ultimately perfect resolution occur. During all this time there may be little or no sputum. The practitioner is naturally much exercised, and he dreads lest tuberculosis should supervene. In a third group the crisis occurs or the fever falls by lysis, but the consolidation persists and there may be intense bronchial breathing, with few or no râles, or the fever may recur and the patient may die exhausted. In 1 of my 100 autopsies a patient, aged fifty-eight, had died on the thirty-second day from the initial chill. The right lung was solid, grayish in color, firm, and presented in places a translucent, semi-homogeneous aspect. In these areas the alveolar walls were thickened, and the plugs filling the air-cells were undergoing transformation into new connective tissue. This fibroid induration may proceed gradually and be associated with shrinkage of the affected side, and the gradual production of a cirrhosis or chronic interstitial pneumonia.

Ordinary fibrinous pneumonia never terminates in tuberculosis. The instances of caseous pneumonia and softening which have followed an acute pneumonic process have been from the outset tuberculous.

**TERMINATION IN ABSCESS.**—This occurred in 4 of my 100 autopsies. Usually the lung breaks down in limited areas and the abscesses are not large, but they may fuse and involve a considerable proportion of a lobe. The condition is recognized by the sputum, which is usually abundant and contains pus and elastic tissue, sometimes cholesterol crystals and hæmatoidin crystals. The cough is often paroxysmal and of great severity; usually the fever is remittent, or in protracted cases intermittent in character, and there may be pronounced hectic symptoms. When a case is seen for the first time it may be difficult to determine whether it is one of abscess of the lung or a local empyæma which has perforated the lung.



**GANGRENE.**—This is most commonly seen in old debilitated persons. It was present in 3 of my 100 autopsies. It very often occurs with abscess. The gangrene is associated with the growth of the saprophytic bacteria on a soil made favorable by the presence of the pneumococcus or the streptococcus. Clinically, the gangrene is rendered very evident by the horribly fetid odor of the expectoration and its characteristic features. In some instances the gangrene may be found post mortem when clinically there has not been any evidence of its existence.

**Prognosis.**—Pneumonia is the most fatal of all acute diseases, killing more than diphtheria, and outranking even consumption as a cause of death.

Hospital statistics show that the mortality ranges from 20 to 40 per cent. Of 1,012 cases at the Montreal General Hospital, the mortality was 20.4 per cent. It appears to be somewhat more fatal in southern climates. Of 3,969 cases treated at the Charity Hospital, New Orleans, the death-rate was 38.01 per cent. The mortality at the Johns Hopkins Hospital has been about 25 per cent in the whites and 30 per cent in the colored. In 704 cases at the Pennsylvania Hospital the mortality was 29 per cent. At the Boston City Hospital, in 1,443 cases the mortality was 29.1 per cent. It has been urged that the mortality in this disease has been steadily increasing, and attempts have been made to connect this increase with the expectant plan of treatment at present in vogue. But the careful and thorough analysis by C. N. Townsend and A. Coolidge, Jr., of 1,000 cases at the Massachusetts General Hospital indicates clearly that, when all circumstances are taken into consideration, this conclusion is not justified.

According to the analysis of 708 cases at St. Thomas's Hospital by Hadden, H. W. G. McKenzie, and W. W. Ord, the mortality progressively increases from the twentieth year, rising from 3.7 per cent under that age to 22 per cent in the third decade, 30.8 per cent in the fourth, 47 per cent in the fifth, 51 per cent in the sixth, 65 per cent in the seventh decade. Of 465,400 cases collected by E. F. Wells from various sources, 94,826 died, a mortality of 20.4 per cent.

The mortality in private practice varies greatly. R. P. Howard treated 170 cases with only 6 per cent of deaths. Fussell has recently reported 134 cases with a mortality of 17.9 per cent. The mortality in children is sometimes very low. Morrill has recently reported 6 deaths in 123 cases of frank pneumonia. On the other hand, Goodhart had 25 deaths in 120 cases.

The following are among the circumstances which influence the prognosis:

**Age.**—As Sturges remarks, the old are likely to die, the young to recover. Under one year it is more fatal than between two and five. Fussell lost 5 out of 8 cases in sucklings. At about sixty the death-rate is very high, amounting to 60 or 80 per cent. From the reports of its fatality in some places, one may say that to die of pneumonia is almost the natural end of old people.

As already stated, the disease is more fatal in the negro than in the white race.

Previous habits of life and the condition of bodily health at the time of the attack form the most important factors in the prognosis of pneumonia. In analyzing a series of fatal cases one is very much impressed with the number of cases in which the organs shown signs of degeneration. In 25 of my

100 autopsies at the Montreal General Hospital the kidneys showed extensive interstitial changes. Individuals debilitated from sickness or poor food, hard drinkers, and that large class of hospital patients, composed of robust-looking laborers between the ages of forty-five and sixty, whose organs show signs of wear and tear, and who have by excesses in alcohol weakened the reserve power, fall an easy prey to the disease. Very few fatal cases occur in robust, healthy adults. Some of the statistics given by army surgeons show better than any others the low mortality from pneumonia in healthy picked men. The death-rate in the German army in over 40,000 cases was only 3.6 per cent.

Certain complications and terminations are particularly serious. The meningitis of pneumonia is probably always fatal. Endocarditis is extremely grave, much more so than pericarditis. Apart from these serious complications, the fatal event in pneumonia is due either to a gradual toxæmia or to mechanical interference with the respiration and circulation.

Much stress has been laid of late upon the factor of *leucocytosis* as an element in the prognosis. A very slight or complete absence of a leucocytosis is rightly regarded as very unfavorable.

*Toxæmia* is the important prognostic feature in the disease, to which in a majority of the cases the degree of pyrexia and the extent of consolidation are entirely subsidiary. It is not at all proportionate to the degree of lung involved. A severe and fatal toxæmia may occur with the consolidation of only a small part of one lobe. On the other hand, a patient with complete solidification of one lung may have no signs of a general infection. The question of individual resistance seems to be the most important one, and one sees even most robust-looking individuals fatally stricken within a few days.

Death is rarely due to direct interference with the function of respiration, even in double pneumonia. Sometimes it seems to be caused by the extensive involvement with œdema of the other parts of the lungs, an engorgement with progressive weakness of the right heart. But death is most frequently due to the action of the poisons on the vaso-motor centres, with progressive lowering of the blood pressure. This is a much more serious factor than direct weakness of the heart muscle itself.

**Diagnosis.**—No disease is more readily recognized in a large majority of the cases. The external characters, the sputa, and the physical signs combine to make one of the clearest of clinical pictures. After a study in the post-mortem room of my own and others' mistakes, I think that the ordinary lobar pneumonia of adults is rarely overlooked. Errors are particularly liable to occur in the intercurrent pneumonias, in those complicating chronic affections, and in the disease as met with in children, the aged, and drunkards. Tuberculo-pneumonic phthisis is frequently confounded with pneumonia. Pleurisy with effusion is, I believe, not often mistaken except in children. The diagnostic points will be referred to under pleurisy.

In diabetes, Bright's disease, chronic heart-disease, pulmonary phthisis, and cancer, an acute pneumonia often ends the scene, and is frequently overlooked. In these cases the temperature is perhaps the best index, and should, more particularly if cough occurs, lead to a careful examination of the lungs. The absence of expectoration and of pulmonary symptoms may make the diagnosis very difficult.

In children there are two special sources of error; the disease may be entirely masked by the cerebral symptoms and the case mistaken for one of meningitis. It is remarkable in these cases how few indications there are of pulmonary trouble. The other condition is pleurisy with effusion, which in children often has deceptive physical signs. The breathing may be intensely tubular and tactile fremitus may be present. The exploratory needle is sometimes required to decide the question. In the old and debilitated a knowledge that the onset of pneumonia is insidious, and that the symptoms are ill-defined and latent, should put the practitioner on his guard and make him very careful in the examination of the lungs in doubtful cases. In chronic alcoholism the cerebral symptoms may completely mask the local process. As mentioned, the disease may assume the form of violent mania, but more commonly the symptoms are those of delirium tremens. In any case, rapid pulse, rapid respiration, and fever are symptoms which should invariably excite suspicion of inflammation of the lungs. Under cerebro-spinal meningitis will be found the points of differential diagnosis between pneumonia and that disease.

Pneumonia is rarely confounded with ordinary consumption, but to differentiate acute tuberculo-pneumonic phthisis is often difficult. The case may set in with a chill. It may be impossible to determine which condition is present until softening occurs and elastic tissue and tubercle bacilli appear in the sputum. A similar mistake is sometimes made in children. With typhoid fever, pneumonia is not infrequently confounded. There are instances of pneumonia with the local signs well marked in which the patient rapidly sinks into what is known as the typhoid state, with dry tongue, rapid pulse, and diarrhoea. Unless the case is seen from the outset it may be very difficult to determine the true nature of the malady. On the other hand, there are cases of typhoid fever which set in with symptoms of lobar pneumonia—the so-called pneumo-typhus. It may be impossible to make a differential diagnosis in such a case unless the characteristic eruption occurs or the Widal reaction be given.

**Prophylaxis.**—We do not know the percentage of individuals who harbor the pneumococcus normally in the secretions of the mouth and throat. In a great majority of cases it is an auto-infection, and the lowered resistance due to exposure or to alcohol, or a trauma or anæsthetization, simply furnishes conditions which favor the spread and growth of a parasite already present. Individuals who have already had pneumonia should be careful to keep the teeth in good condition, and the mouth and throat in as healthy a state as possible. Antiseptic mouth washes may be used.

We know practically nothing of the conditions under which the pneumococcus lives outside the body, or how it gains entrance in healthy individuals. The sputum of each case should be very carefully disinfected. In institutions the cases should be isolated.

**Treatment.**—Pneumonia is a self-limited disease, which can neither be aborted nor cut short by any known means at our command. Even under the most unfavorable circumstances it may terminate abruptly and naturally. A patient was admitted to the Philadelphia Hospital on the evening of the seventh day after the chill, in which he had been seen by one of my assistants, who had ordered him to go to a hospital. He remained, however, in his house

alone, without assistance, taking nothing but a little milk and bread and whisky, and was brought into the hospital by the police in a condition of active delirium. That night his temperature was  $105^{\circ}$  and his pulse above 120. In his delirium he tried to escape through the window of the ward. The following morning—the eighth day—the crisis occurred, and the temperature was below  $98^{\circ}$ . The entire lower lobe of the right side was involved, and he entered upon a rapid convalescence. So also, under the favoring circumstances of good nursing and careful diet, the experience of many physicians in different lands has shown that pneumonia runs its course in a definite time, terminating sometimes spontaneously on the third or the fifth day, or continuing until the tenth or twelfth.

There is no specific treatment for pneumonia. The young practitioner should bear in mind that patients are more often damaged than helped by the promiscuous drugging, which is still only too prevalent.

1. GENERAL MANAGEMENT OF A CASE.—The same careful hygiene of the bed and of the sick-room should be carried out as in typhoid fever. When conditions are favorable the bed may be wheeled into the open air. The patient should not be too much bundled up with clothing. For the heavy flannel undershirts should be substituted a thin, light flannel jacket, open in front, which enables the physician to make his examinations without unnecessarily disturbing the patient. The room should be bright and light, letting in the sunshine if possible, and thoroughly well ventilated. Only one or two persons should be allowed in the room at a time. Even when not called for on account of the high fever, the patient should be carefully sponged each day with tepid water. This should be done with as little disturbance as possible. Special care should be taken to keep the mouth and gums cleansed.

2. DIET.—Plain water, a pleasant table water, or lemonade should be given freely. When the patient is delirious the water should be given at fixed intervals. The food should be liquid, consisting chiefly of milk, either alone or, better, mixed with food prepared from some one of the cereals, and eggs, either soft boiled or raw.

3. SPECIAL TREATMENT.—Certain measures are believed to have an influence in arresting, controlling, or cutting short the disease. It is very difficult for the practitioner to arrive at satisfactory conclusions on this question in a disease so singularly variable in its course. How natural, when on the third or fourth day the crisis occurs and convalescence sets in, to attribute the happy result to the effect of some special medication! How easy to forget that the same unexpected early recoveries occur under other conditions! The following are among the measures which may be helpful:

(a) *Bleeding*.—The reproach of Van Helmont, that “a bloody Moloch presides in the chairs of medicine,” can not be brought against this generation of physicians. Before Louis' iconoclastic paper on bleeding in pneumonia it would have been regarded as almost criminal to treat a case without venesection. We employ it nowadays much more than we did a few years ago, but more often late in the disease than early. To bleed at the very onset in robust, healthy individuals in whom the disease sets in with great intensity and high fever is, I believe, a good practice. I have seen instances in which it was very beneficial in relieving the pain and the dyspnea, reducing the temperature, and allaying the cerebral symptoms.

(b) *Drugs*.—Certain drugs are credited with the power of reducing the intensity and shortening the duration of the attack. Among them veratrum viride still holds a place, doses of ℥ij-v of the tincture given every two hours. Tartar emetic—a remedy which had great vogue some years ago—is now very rarely employed. To a third drug, digitalis, has been attributed of late great power in controlling the course of the disease. Petresco gives at one time as much as from 4 to 12 grammes of the powdered leaves, and claims that these colossal doses are specially efficacious in shortening the course of the disease and diminishing the mortality.

(c) *Antipneumococcic Serum*.—Anders' recent analyses of the reported cases do not give a very favorable impression of the value of the sera at present in use. More perhaps may be expected from the polyvalent serum of Römer, but even with it 4 of the 24 cases treated in Curschmann's clinic died (Pässler).

4. SYMPTOMATIC TREATMENT.—(a) *To relieve the Pain*.—The stitch in the side at onset, which is sometimes so agonizing, is best relieved by a hypodermic injection of a quarter of a grain of morphia. When the pain is less intense and diffuse over one side, the Paquelin cautery applied lightly is very efficacious, or hot or cold applications may be tried. When the disease is fairly established the pain is not, as a rule, distressing, except when the patient coughs, and for this the Dover's powder may be used in 5-grain doses, according to the patient's needs. Hot poultices, formerly so much in use, relieve the pain, though not more than the cold applications. For children they are often preferable.

(b) *To combat the Toxæmia*.—Until we have a specific, either drug or the product of the bacteriological laboratory, which will safely and surely neutralize the toxins of the disease, we must be content with measures which promote the elimination of the poisons. Unfortunately, we know very little of the channels by which they are got rid of, but on general principles we may suppose them to be the skin, the kidneys, and the bowels. By the tepid or the cold bath not only is the action of the skin promoted, but the vaso-motor centres are stimulated. Abundance of water should be given to promote the flow of urine, and the saline infusion seems to act helpfully in this way. The bowels should be kept freely open by saline laxatives.

(c) The third and all-important indication in the treatment of pneumonia is *to support the circulation*. We can not at present separate the effects of the fever from those of the toxins. It is possible, indeed, as some suppose, that the fever itself may be beneficial. Undoubtedly, however, high and prolonged pyrexia is dangerous to the heart, and should be combated. For this our most trusty weapon is *hydrotherapy*, which in pneumonia is used in several different ways. The ice-bag to the affected side is one of the most convenient and serviceable. It allays the pain, reduces the fever slightly, and, as a rule, the patient says he feels very much more comfortable. Broad, flat ice-bags are now easily obtained for the purpose, and if these are not available an ice poultice can be readily made, and by the use of oil-silk the clothing and bedding of the patient can be protected from the water. Cold sponging is the best form of hydrotherapy to employ as a routine measure. When done limb by limb the patient is but little disturbed, and it is refreshing and beneficial. With very pronounced nervous symptoms and persistent high tempera-

ture, or with hyperpyrexia, a cold bath of ten minutes' duration may be given. Probably the very best effect of the hydrotherapy is in the stimulating effect on the vaso-motor centres. The dusky skin, increasing cyanosis, increasing shortness of breath, with signs of oedema of the lungs, and the rapid, small, soft pulse, tell of a progressive lowering of the blood tension. Digitalin given hypodermically in full doses,  $\frac{1}{16}$ – $\frac{1}{8}$  gr., and strychnine,  $\frac{1}{32}$ – $\frac{1}{16}$  gr., are the most satisfactory drugs to support the blood pressure. Camphor and caffein and musk are also of value. The effect of adrenalin, even in intravenous injection, is too transitory to be of any value. Alcohol does not seem to raise the blood pressure in fever, and the studies of Briggs and Cook in my wards would indicate that it is not of much value in progressive vaso-motor collapse. This does not mean, however, that it may not have a value in the fever, and I should be sorry to give up its use in the severer forms of enteric and of pneumonia. Saline infusions promote elimination and may help in tiding over a period of vascular depression. A litre may be allowed to run by gravity beneath the skin, and if necessary may be repeated two or three times in the twenty-four hours.

*Oxygen Gas.*—It is doubtful whether the inhalation of oxygen in pneumonia is really beneficial. The work of Lorrain-Smith suggests, indeed, that it may under certain circumstances be positively harmful. He has shown experimentally that oxygen may be a serious irritant, actually producing inflammation of the lungs. If we are justified in applying his results to man, there can be but little doubt that the administration of oxygen may not be entirely "harmless," as stated in previous editions of this work. If the tension of the oxygen breathed rises to 80 per cent of an atmosphere, which it might easily do in certain methods of administration, it may be injurious. When used it should be allowed to flow gently from the nozzle held at a little distance, in which way it is freely diluted with air.

*Treatment of Complications.*—If the fever persists it is important to look out for pleurisy, particularly for the meta-pneumonic empyema. The exploratory needle should be used if necessary. A sero-fibrinous effusion should be aspirated, a purulent opened and drained. In a complicating pericarditis with a large effusion aspiration may be necessary. Delayed resolution is a difficult condition to treat. Fibrotysin, 2.5 cc. every other day, has been used successfully in a few cases (Crofton).

## XVI. DIPHTHERIA.

*Definition.*—A specific infectious disease, characterized by a local fibrinous exudate, usually upon a mucous membrane, and by constitutional symptoms due to toxins produced at the site of the lesion. The presence of the Klebs-Loeffler bacillus is the etiological criterion by which true diphtheria is distinguished from other forms of membranous inflammation.

The clinical and bacteriological conceptions of diphtheria are at present not in full accord. On the one hand, there are cases of simple sore throat which the bacteriologists, finding the Klebs-Loeffler bacillus, call true diphtheria. On the other hand, cases of membranous, sloughing angina, diagnosed by the physician as diphtheria, are called by the bacteriologists, in