

# PROGRESS IN PEDIATRICS

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## REVIEW OF THE LITERATURE OF RESPIRATORY DISEASES OF THE PAST YEAR

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### RESPIRATORY DISEASES, MORTALITY AND MORBIDITY

Woodward<sup>1</sup> has made a study of the respiratory diseases as a factor in the causes of infant mortality. In 1913 in the first year of life the diseases of the respiratory system ranked third in the causes of death; 15.85 per cent. of the total deaths were due to respiratory diseases; 25 per cent. of the mortality from respiratory diseases at all ages occurred in the first year of life. Bronchitis and pneumonia caused 96 per cent. of the deaths by respiratory diseases in infants. The mortality in cities was slightly higher than in the country. The third week of life was the maximum danger period for bronchitis and pneumonia. He concludes that prevention of death in infancy from respiratory diseases is a task which requires the united efforts of the prenatal nurse, obstetrician, midwife, pediatrician and infant welfare station.

Haynes<sup>2</sup> believes that vital statistics do not measure the importance of respiratory diseases, since most patients recover, but a vast amount of damage is done which is not shown by the death rate. The ordinary infectious cold results in ear, kidney and cardiac damage of no small amount. From November to June the bulk of pediatric practice is due to respiratory diseases. Forty per cent. of the deaths in the first five years are due to respiratory conditions and 25 per cent. of all deaths from respiratory diseases are in the first five years. Rickets, infectious diseases, enlarged adenoids and tonsils all predispose greatly to respiratory infection. There are certain anatomic factors in the young which render any respiratory inflammation serious; that is, the narrowness of the respiratory passages, nose, larynx, bronchi, which are easily obstructed by the secretions, the shape of the thorax, the soft ribs, and the habitually recumbent position. Lowering of resistance by cold, fatigue, autointoxication or poisoning by food or chemical substances are also important predisposing factors. The actual infection usually takes place by spray from the mouth and nose discharges of an infected person. The helpless infant must be protected from dust, both outdoors

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1. Woodward, W. C.: *Am. Jour. Obstet.*, 1916, lxxiii, 362.

2. Haynes, R. S.: *Arch Pediat.*, 1916, xxxiii, 81.

and indoors, from smoke which is harmful as a mechanical irritant, and from crowding, since close contact increases the possible transmission of infection by sneezing and coughing.

In the regulation of infectious diseases, early quarantine is more important than disinfection and fumigation afterward. Crowding is especially dangerous in hospitals, and the box system, or screens, is a great aid in preventing transmission of infection. The early exclusion from school of every child with a slight cold is absolutely necessary to prevent transmission of colds, not only to his schoolmates, but to the smaller children in their various families. The discharges from the nose and mouth of a sick child should be carefully caught on gauze which should be burned, and the bedding, etc., disinfected.

Among preventive measures are careful feeding, enough sleep, proper clothing, a clean skin and careful regulation of the bowels. The air in the house should be kept at 65 F., with a humidity of 60 per cent. Young children should not be taken out on windy and damp days.

Hill<sup>3</sup> states that epidemics of colds are most common when the humidity is great, the temperature variable but cold, in raw weather with thawing snow or cold rain and wet ground. Persons living in the open air are free from colds. Children during their holiday paddle all day in the sea with bare legs. When they are shut in the schoolroom, colds begin. This is probably due to propinquity, since children are nearer together indoors. Out of doors the sprays of saliva and nasal mucus are blown away and are less likely to come in contact with healthy children. The colds may be caused by bacterial infections, dust, irritating fumes, pollens, etc. Hill has made observations on the nasal mucous membrane and has found that out of doors it is pale, taut, and does not pit on pressure with a probe. Indoors it is swollen, congested, covered with thick secretion and pits on pressure. He thinks this is due to the fact that outdoors the air nearer the ground is warmer because it moves less rapidly than at the level of the head. Indoors the reverse is true. The floors are cold and drafty and the head is immersed in hot, stagnant air. He believes that the nasal obstruction is due to chilling of the feet when the head is warm, and has found that warming the feet will relieve the congestion observed indoors.

Ideal conditions would give a warm floor, radiant heat and abundant cool air in motion. Open fires approach this more nearly than any other method of heating, since the feet can be warmed by radiant heat and most of the heat goes up the chimney. He believes that the boggy condition of the nasal mucous membrane predisposes to infection by bacteria. Sudden changes from the warm indoor air to the colder air

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3. Hill, L.: *Brit. Med. Jour.*, 1916, i, 541.

out of doors are bad on account of the sudden demand for more blood in the nose which is necessary to compensate for the cooling of the mucous membrane and the more rapid evaporation from its surface.

Peiper<sup>4</sup> believes that respiratory infections in infants come not from chilling alone, but from infection from other persons. Infections are not always influenzal, though "conveniently classed as grippe." Infants should be carefully protected from these infections, as far as possible, by a room of even temperature, avoidance of chilling, and of cold drafts, especially at the bath. In raw weather a child should remain indoors. The mother should avoid infected persons and if she contracts cold or cough, must use every effort possible to protect the child from infection.

Peiper describes accurately and briefly the various infections of the upper respiratory tract, the bronchi and lungs. He also describes the treatment of the various conditions arising more fully and carefully than is usual with most foreign writers. The treatment of capillary bronchitis and bronchopneumonia are especially good. The technic of, and indications for, cold packs, mustard packs, hot baths, etc., are given in detail in excellent manner.

Miller and Noble<sup>5</sup> investigated the effect of chilling on the incidence of respiratory diseases in rabbits. They used rabbits infected with the *Bacillus bovisepiticus*, because it is an organism normally pathologic for rabbits. They conclude that respiratory infections of rabbits are favored by chilling the animals after they have been accustomed to heat, and that the weight of evidence does not justify the elimination of cold as a possible though secondary factor in the incidence of respiratory diseases.

Marked changes of temperature from low to high predispose even more to respiratory infection than from high to low.

#### ROENTGEN RAY IN DIAGNOSIS

Freeman<sup>6</sup> calls attention to the value of the Roentgen ray in intra-thoracic lesions in childhood. It is a useful aid to auscultation and percussion in clearing up the diagnosis of doubtful conditions. The Roentgen ray has its greatest value in tuberculosis, and in pneumonia without physical signs. In cardiac lesions it gives information as to the size and shape of the heart and the presence of exudate in the pericardium. In the case of a child with an elevated temperature with sibilant, sonorous, or crepitant râles through the lungs, and positive

4. Peiper, E.: Deutsch. med. Wchnschr., 1916, pp. 213 and 245.

5. Miller, J. A., and Noble, W. C.: Jour. Exper. Med., 1916, xxiv, 223.

6. Freeman, R. G.: Arch. Pediat., 1915, xxxii, 891.

von Pirquet, it is impossible to distinguish a bronchitis with small latent focus of tuberculosis from a case of miliary tuberculosis. The Roentgen ray is the only means at our command for making this diagnosis.

It is extremely valuable, also, for distinguishing effusion from consolidation, pneumothorax, etc. The thymus, bronchial and mediastinal lymph nodes often cast shadows, making a diagnosis possible. Freeman reports a case of pneumonia without physical signs, one with pericardial effusion, and a case of endocarditis in which the size of the heart showed the effect of rest and treatment.

#### ASTHMA

Cameron<sup>7</sup> believes that asthma is a respiratory neurosis. In children it is characterized more by the bronchitic than by spasmodic symptoms, and it is often impossible to determine whether a given attack is asthmatic or not by the physical signs. The following points suggest asthma:

1. Family history of asthma, gout or migraine.
2. Exudative diathesis (eczema, seborrhea, urticaria).
3. Eosinophilia.

Cameron believes that psychical treatment is very important, and that every effort should be made to avoid frightening the child during the paroxysm by overanxiety on the part of the parents. During an acute attack the room should be brightly lighted and the child should be diverted if possible by books or toys. A hot bath or an emetic sometimes relieves the attack. Chloral or atropin are considered the best drugs.

He advises a diet largely of fruits, vegetables and cereals, avoiding eggs and milk, and giving meat in small amounts only once a day. Adenoids should be removed if present. Fresh air and vigorous exercise are important. Potassium iodid should be administered. In infants treatment must be directed toward the bronchitis by confinement to the room, steam, counterirritation, etc.

Jackson<sup>8</sup> describes the manner in which drugs act in relieving asthmatic attacks. He divides their mode of action into two groups.

The first group acts by paralyzing the endings of the bronchoconstrictor nerves to the muscle fibers of the bronchioles, causing a relaxation of the bronchioles. To this group belong atropin, hyoscin, etc.

The second group acts by stimulating the endings of the bronchodilator nerves. This is the way in which epinephrin and allied drugs act.

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7. Cameron: *Guy's Hosp. Gaz.*, 1915, xxix, 319.

8. Jackson, D. E.: *Jour. Lab. and Clin. Med.*, 1915, i, 126.

It is probable that two forms of the disease may exist. These can be demonstrated experimentally. From clinical evidence it may be that these two forms may exist separately or at the same time.

The first form is due to nervous influence, central, peripheral or reflex. Nervous impulses arising from direct central influence or reflexly excited (as by a nasal sinus disease) pass down the bronchoconstrictor nerves and stimulate the muscles to contract. Possibly chemical substances in the blood may stimulate these endings directly or by acting on the ganglia in their course. We know of no such substances produced in the body, but experimentally arecoline will cause bronchoconstriction which is relieved or prevented by atropin.

The second form is due to direct stimulation of the muscle fibers of the bronchus. It may be produced experimentally by enormous doses of atropin or hyoscin. It is very evident that atropin will do no good in this type of the disease. Epinephrin relieves it by stimulating the bronchodilator endings which the atropin has not affected.

A considerable number of drugs will cause direct muscular spasm independent of innervation; for example, morphin, codein, heroin, narcotin, some of the metallic salts. A spasm caused by these drugs is more lasting than that due to the nervous form of asthma and more difficult to treat by the drugs acting on the bronchodilators.

Guinea-pigs with anaphylactic shock die chiefly from constriction of the bronchi. Atropin is of slight value in these cases, much less so than a full dose of epinephrin. It has been suggested that the substance formed in anaphylaxis is histamin or some related substance. Histamin is formed from histidin by certain bacteria. In animals histamin causes bronchoconstriction of a severe type which yields but slightly to atropin. It is possible that histamin or some related substance may be the cause of asthma in man.

Pilocarpin causes great bronchoconstriction by stimulation of the peripheral nerve endings. It is difficult to see how this drug can relieve asthma, although it has been said to do so in some cases. Possibly it does so by stimulation of the adrenal to increased secretion, and this may explain a paradoxical bronchodilatation.

#### BACTERIOLOGY OF NASAL INFECTIONS

Foster<sup>9</sup> points out that a great variety of organisms have been thought to be the cause of a common cold in the head. He has repeated Kruse's experiment with Berkefeld filtrates from the discharges of coryza. The discharges were mixed with salt solution and passed through a Berkefeld filter. The filtrate was sterile on ordinary culture

9. Foster: Jour. Am. Med. Assn., 1916, lxvi, 1180.

mediums, both aerobic and anaerobic. Ten soldiers were inoculated by dropping this clear filtrate into their noses, and nine developed typical colds in the head. Foster applied the culture methods developed by Noguchi and others, using rabbit kidney and ascitic fluid covered with oil. With this medium and the above filtrate he obtained a cloudiness around the pieces of tissue which was not obtained in controls and the repeated subcultures gave the same findings. The cultures under the dark field microscope showed small globular bodies which were apparently motile, and these were also seen in stained smears. The filtrates from these subcultures were also clear, and sterile with ordinary culture methods. When inoculated into the noses of eleven patients they produced acute coryza, and cultures from the discharges of these cases on ascitic tissue mediums gave the same clouding of the fluid around the pieces of tissue which were observed in the original cultures.

Baxter<sup>10</sup> made a study of sixty cases of postnasal infection in childhood, which was very prevalent in the earlier part of 1915. It was nearly all due to staphylococcus. The middle ear was involved in 75 per cent. of the cases, and this was especially common under 2 years of age. There were few other complications except cervical adenitis.

Baxter advises nasal douches with gravity pressure and the use of sodium bicarbonate or citrate, internally. He thinks that one should not be too hasty in puncturing the membrana tympani, since many cases will subside without puncture under irrigations with bicarbonate or boric acid solutions.

#### INFLUENZA

Leo-Wolff<sup>11</sup> distinguishes between influenza which is an acute infectious epidemic disease, due to *Bacillus influenzae*, and grip or grippy colds, due to pneumococcus, streptococcus, *Micrococcus catarrhalis* or Friedländer's bacillus. He believes that climatic changes, exposure to cold, or anything that lowers the vitality of the patient, predisposes to both. The mode of transmission is usually through sneezing, coughing, etc. In hospitals, epidemics may be averted or minimized by the exclusion of visitors, the wearing of gauze masks by doctors or nurses having colds, and by the separation of infants by gauze screens.

He calls attention to the fact that influenza often simulates measles, scarlet fever, meningitis and digestive disturbances in infants, and that sporadic cases are very difficult of diagnosis in such atypical cases. A general discussion of the two groups above mentioned brings out nothing of great value.

10. Baxter, G. E.: Arch. Pediat., 1916, xxxiii, 729.

11. Leo-Wolff: Med. Rec., New York, 1916, lxxxix, 226.

## PNEUMONIA

In a preliminary report of 1,000 cases of pneumonia Pisek and Pease<sup>12</sup> have found a mortality of 34.3 per cent.

In 445 cases of bronchopneumonia the mortality was 41 per cent.

In 227 of lobar pneumonia the mortality was 28.1 per cent.

Of the bronchopneumonia patients, the greater proportion were under 2 years of age. The mortality was 52 per cent. in the first year, and there were no deaths over 3 years.

Of the lobar pneumonia, while there was a larger percentage of the cases above 2 years of age, there was still a considerable number under that age (seventy-five in the first year and ninety-seven in the second year).

There was noted a marked difference in the variation of mortality in the epidemics of different years. The bacteria found in the lobar pneumonia cases were pneumococci with a few staphylococci and streptococci. In bronchopneumonia, streptococci, staphylococci and influenza bacilli predominated. Pneumococci with streptococci and staphylococci were also found, that is, mixed infections, and in these cases the pneumococci were usually of a low grade of virulence.

The character of the infection depended on the amount of natural or acquired resistance of the patient, the state of his vitality, local changes in the respiratory tract and the virulence of the organism.

Forty-eight cases were studied according to the type of the pneumococcus with the following results:

	Lobar	Broncho	Deaths	Death Rate
Type I .....	9	2	1	22.9
Type II .....	11	3	5	29.3
Type III .....	1	3	1	8.3
Type IV .....	7	12	4	39.8

Wollstein and Benson<sup>13</sup> have studied the organisms present in pneumonia in children in fifty cases to determine the type of pneumococcus present. They found Type IV in 60 per cent. of the cases, usually associated with one of the other types. The mortality was 40 per cent.

In Type I the mortality was 83 per cent., and in Type II, 33 per cent. This differs from the findings in adults in whom Type II has a higher mortality than Type I, and in whom Type IV is not often fatal.

Dunn and Hammond<sup>14</sup> report a case of pneumonia in a child of 14½ months, due to Friedländer's bacillus. The left lower lobe was involved, then the left upper lobe. Thoracentesis was performed on account of persistent temperature and signs at the base, and a small

12. Pisek, G. R., and Pease, M. C.: *Am. Jour. Med. Sc.*, 1916, cii, 14.

13. Wollstein, M., and Benson, A. W.: *AM. JOUR. DIS. CHILD.*, 1916, xii, 254.

14. Dunn, C. H., and Hammond, J.: *Interstate Med. Jour.*, 1915, xxii, 1133.

amount of fibrinous material was withdrawn from the lung. This gave a culture of Friedländer's bacillus, and this finding was confirmed by a second puncture. The fever persisted for eighteen days and the temperature dropped by crisis. The child made a good recovery. The case was reported in detail on account of the rarity of recovery from an infection with this organism.

Perrot<sup>15</sup> considers facial herpes in pneumonia or pneumococcal infections to be always a localization in the skin or mucous membrane of the pneumococcus, which is always found in the contents of the vesicle.

Herpes is often the principal manifestation of pneumococcal infection, the signs of pneumonia being ill-marked or absent. The same is true of pneumococcal septicemia, stomatitis, angina or meningitis. Infection of the skin probably takes place through the blood stream. He gives several illustrations of cases in which the herpes is the main feature of the infection.

Mason<sup>16</sup> confirms the findings of Weill and Mouriquand that central pneumonia does not exist; that the shadow cast by a pneumococcal consolidation is triangular in shape, the base in the axilla, the apex toward the hilum. When the apex of the bronchial shadow does not extend to the root of the lung, bronchial voice and breathing are not heard. As soon as the consolidation extends far enough to come in contact with the large bronchi at the hilum, bronchial voice and breathing are heard.

This gives a most reasonable explanation for the absence of physical signs in the early stages of consolidation and can be easily verified in any case in which daily roentgenograms are taken.

Hutinel<sup>17</sup> considers that pulmonary complications are not rare in scarlet fever, which is contrary to the usual opinion. In five years he observed 2,500 cases of scarlet fever, and one-third of the deaths were from pneumonia. These occurred in three forms: bronchopneumonia, lobar pneumonia and congestive pneumonia or pseudo-lobar bronchopneumonia.

Bronchopneumonia is frequent in small infants in severe cases with purulent rhinitis, otitis, severe angina, etc. It is streptococcal in origin and is an extension from the infection of the upper air passages. Deformities of the chest from rickets and Pott's disease predispose to pneumonia. The most severe cases are those associated with measles following scarlet, or when the pneumonia appears in an epidemic form among a group of children in a scarlet ward. These facts are well

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15. Perrot, J.: Thèse de Lyon, 1913-1914, No. 130; abstr. in *Brit. Jour. Dis. Child.*, 1916, xiii.

16. Mason, H. H.: *AM. JOUR. DIS. CHILD.*, 1916, xi, 188.

17. Hutinel, V.: *Arch. de méd. d. enfants*, 1916, xix, 57.



known, but the frequency of pneumonia is commonly underestimated, being overlooked in children who are gravely ill. If its occurrence is not borne in mind it will only be found on the necropsy table.

Lobar pneumonia occurs in three groups according to the time of its onset. Hutinel has called certain of these cases "pneum scarlatina," which he considers comparable to cases of pneumotypoid.

He differentiates three groups as follows:

1. The pneumonia precedes scarlet by several days.
2. The pneumonia comes on during the course of scarlet.
3. The pneumonia comes on during convalescence.

In the first form the ordinary symptoms of the pneumonia exist, and the appearance of the scarlet rash comes as a surprise. It is difficult to determine whether the rash is toxic in origin or true scarlet. The pneumonia is probably not due to the scarlet, but is an ordinary pneumococcus infection. The appearance of the scarlet does not change the diagnosis; it is merely a superadded infection. It can be determined that it is a true scarlet from the course and symptoms. The red throat, tongue, cervical adenitis, desquamation and late complications are those of scarlet. The two infections modify each other, however, and resolution is usually slower than in an ordinary pneumonia. Pleural reactions are nearly constant.

The pleurisy may be serofibrinous or a simple parapneumonic, non-infectious effusion, but usually becomes purulent. It may be due to streptococcus or pneumococcus. Some cases show pneumococcus in the sputum and streptococcus in the effusion. The prognosis is doubtful. Some patients recover, but with slow convalescence, often protracted by the late complications of scarlet.

Relapses of the scarlet fever seem to be abnormally frequent, following these cases, and may come on as late as sixty to seventy days after the original infection.

The second group, in which the pneumonia appears during the acute stage of the scarlet, is divided into two subgroups:

(a) In the first subgroup the pneumonia appears at the same time as the rash. It is contemporary with the angina, usually apical, and is sometimes mild and sometimes fatal. It resembles in its characters ordinary lobar pneumonia.

(b) In the second subgroup the pneumonia appears after the eruption has existed several days. It is usually at the bases, bilateral, and resembles bronchopneumonia. It is commonly a streptococcal infection and the prognosis is usually grave.

The pleural reactions are frequent, and vary from a transient clear effusion to an empyema of a severe type. The scarlet symptoms rarely predominate, but are generally of subsidiary importance.

The third group comprises pneumonias occurring during convalescence. These are accidental pneumococcus infections. They are not very rare and the prognosis is usually good. Pleural complications are frequent, however, and they seem to predispose to relapses of the scarlet in the same manner as the first group. In the cases complicated by empyema, prognosis is less good, 30 per cent. being fatal.

Hutinel concludes that in pneumonia and scarlet occurring together, the infections are apt to aggravate each other; the pneumonia is influenced more than the scarlet, and its prognosis is much less favorable than in an uncomplicated pneumonia. The pleural complications are frequent, varying from a mild serous effusion to severe empyema. Relapses occur in one third of the cases complicated by pneumonia. This is very much more common than in uncomplicated scarlet, in which relapses occur in not more than 1 per cent. Hutinel suggests the possibility that pneumonia modifies the effort of the organism acquiring immunity, and so makes reinfection with scarlet more common. This paper is illustrated by many cases reported in detail.

Toupance<sup>18</sup> considers that the respiratory complications of scarlet fever are less rare than the textbooks usually state.

He has found laryngitis in 5 per cent. of the cases, due to streptococcus. In young children it is usually fatal.

Bronchitis occurs in 2 to 6 per cent. It is commonly mild and always suggests the possibility of measles.

Bronchopneumonia is found in 1 to 2½ per cent. of hospital cases, usually accompanying severe infections of the nasopharynx or general sepsis. The mortality is 50 per cent.

Lobar pneumonia was found in 1 per cent. of the cases. It may coincide with the onset of the scarlatina and the two diseases run their course without effect on each other. Relapses are common in such cases. When it occurs during the eruptive or desquamative stages it tends to affect the apex of the lung and often runs a torpid form which is difficult of recognition. It is frequently accompanied by pleural effusion.

Pleurisy is found in 0.8 per cent. of the scarlatina cases; two thirds of these are purulent.

Of the empyema observed, some cases have been generalized, some have been "latent" (bronchopneumonia with interlobar effusion); all have been characterized by rapid pus formation, abundant effusion, and grave general condition. The death rate was 40 per cent.

Serofibrinous pleurisy has usually been of streptococcus origin. It may be associated with foci of pulmonary congestion or complicated by pericarditis or tuberculosis.

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18. Toupance, M.: Thèses de Paris, 1914-1915, No. 80.

Allan<sup>19</sup> reports a case of a child with abdominal symptoms indicating acute appendicitis. Operating on the sixth day of the disease, the appendix was found to be inflamed, contained a blood clot and several thread worms. The anesthetic was chloroform-ether. A cough developed the day after the operation and signs of consolidation were discovered at both bases. Two days after the operation, the eighth day of the disease, the temperature, which had been persistently high, fell by crisis. The case is remarkable on account of the definite inflammation of the appendix in a case of pneumonia, showing it was not an ordinary case of pneumonia with abdominal signs.

Caillè<sup>20</sup> reports three cases of foreign-body pneumonia. The first was a child of 2 years and 10 months who had been sick for four weeks with fever and chills and vomiting followed by dyspnea. There were purulent sputum and leukocytosis, with dulness at the base of the right posterior chest. The Roentgen ray showed a tack in the bronchus, which was removed by a bronchoscope guided by the fluoroscope.

The second was a child of 2 years who had had pneumonia the year before, following which there was persistent cough and physical signs (flatness over the chest, bronchial breathing and râles). The Roentgen ray showed a nail in the left bronchus and trachea. An effort was made to remove this with the bronchoscope, but this was unsuccessful. A second attempt through a tracheotomy wound was successful, but pneumonia resulted and the child died.

The third was a 4-year-old child who swallowed a shawl pin three days before admission. The Roengen ray showed the pin to be in the left bronchus. An attempt was made to remove the pin, but this was unsuccessful and following this there was a fever which lasted two weeks. The pin was finally coughed up forty-three days after it was swallowed.

Caillè emphasizes the importance of using the Roentgen ray in unresolved and atypical pneumonia. He urges that all foreign-body cases be reported in the lay press as a warning to parents to keep objects which might be inhaled or swallowed out of the reach of small children. The indirect suggestion offered children by seeing parents put things in their own mouths may lead to imitation by the children. It should, therefore, be avoided.

Clarke<sup>21</sup> reports his experience in about thirty cases of pneumonia treated with hexamethylenetetramin. In every case except one the temperature started to fall a few hours after beginning the drug, and in

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19. Allan, J.: *Brit. Jour. Child. Dis.*, 1916, xiii, 207.

20. Caillè, A.: *Arch. Pediat.*, 1915, xxxii, 881.

21. Clarke, T. W.: *New York State Jour. Med.*, 1915, xv, 445.

every case the patient became well in twenty-four to forty-eight hours. The drug was given in most cases during the first four days of the disease. There was one bronchopneumonia resulting in death in an infant of 4 months.

Whenever a child has failed to respond in forty-eight hours he has always been able to find a complication. He also has given the same remedy in influenza, measles and pertussis and has had no pulmonary complications. He pushes the drug to the limit of tolerance, well diluted in water or milk. Occasionally strangury or hematuria results, in which case the drug is discontinued and sodium bicarbonate given.

In a clinical lecture on the treatment of bronchopneumonia, Marfan<sup>22</sup> advises that the sick-room should be kept at 62 F., with free ventilation, but avoiding chilling the patient. The child's position should be changed frequently to avoid congestion at the bases.

Nasal catarrh should be treated by instillations of eucalyptol in oil, 1 to 6, or collargol, 1 per cent.

If there is no digestive disturbance, the child should be fed "as in any other febrile state with equal parts of milk and sweetened water."

He differentiates four forms of the disease, acute, hyperacute (capillary bronchitis), subacute, and latent. He advises counterirritation by hot baths at 100 F. every three hours when the temperature reaches 102.5. These provoke vasodilatation, relieve the dyspnea and promote sleep. Wet packs at 80 F. can be given from the arm pits to the umbilicus for one and a half hours. The nondepressing expectorants such as ergotin and nux vomica may be used.

In influenzal cases he recommends inunctions of collargol, 3, lanolin and petrolatum of each, 10 parts.

In the suffocation attacks of the hyperacute form, mustard baths or mustard packs should be used and stimulation with camphor, caffeine and oxygen are necessary.

#### COLD AIR IN TREATMENT

Morse<sup>23</sup> differentiates between the value of fresh air and cold air in the treatment of respiratory infections in childhood. Discomfort in a closed room is not due to expired poisons, but to warmth, moisture and stagnation of the air. Fresh air is air that is cool, dry and in motion. Dust is undesirable.

It is possible to lay down the following rules from clinical experience:

In nasopharyngitis cold air is irritating in the early stages and predisposes to otitis. Fresh air is of advantage, but it should be warm.

22. Marfan, A.: *Med. Press and Circular*, 1915, c, 408.

23. Morse, J. L.: *Jour. Am. Med. Assn.*, 1916, lxxiii, 375.

The child should be kept in a room at a temperature not below 60 F., if he is kept in bed, or 65 to 66 if out of bed.

In laryngitis, cold air is very irritating in the early stages, but has no effect later. Patients are more comfortable if the air is moist, and at about 70 F.

In acute bronchitis the cough and sternal oppression are increased by cold air in the beginning of the disease. Children should be kept at a temperature of 60 to 70 F., and the air should be moist. In later stages cold air is less irritating, but has no advantage over warm air. It is no longer necessary to have the air moistened, as the mucous membrane of the bronchi is covered with secretion.

In bronchopneumonia the acute stage of the bronchitis is usually passed, and hence there is no contraindication to the use of cold air.

In lobar pneumonia there is usually no bronchitis and here cold air has its greatest value. There is no question that the general stimulating effect of the cold is of great advantage. The patients are much more comfortable, but the available statistics show but little difference in the mortality in children treated in cold air.

Freeman<sup>24</sup> believes that the pediatricist has a powerful therapeutic agent in moving, cool outdoor air. It stimulates the appetite, induces quiet sleep, brings color to the cheek, increases the resistance to infection.

Howland and Hoobler's observation that the blood pressure is raised by a change from a warm room to cold air has not been confirmed by later observers, and so the good results cannot be attributed to the effect on the circulation. The favorable action of fresh air is probably due to the absence of the depressing effect of the air in closed rooms. It has been shown that this is not due to diminished oxygen or increased carbon dioxide in the air, but to the fact that stagnant, warm, moist air prevents cooling of the body. In cool fresh air the body can cool itself more easily. Outdoor porches are best in the treatment of sick children and are probably applicable to all infectious diseases except possibly scarlet and measles. Fresh air finds its greater use in pneumonia and tuberculosis. The best substitute for the sleeping porch is a room with cheese cloth screens in the windows.

Premature infants should be kept in air which is warm enough to keep up the body temperature, but it should be freely moving warm air, not stagnant.

In renal and cardiac cases the value of cold air is doubtful. Freeman believes that parents and children should be thoroughly trained to the value of fresh air and away from the idea of the harmfulness of drafts.

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24. Freeman, R. G.: *Arch. Pediat.*, 1916, xxxiii, 330.

Cunningham<sup>25</sup> has analyzed 1,500 cases of pneumonia treated in the Children's Hospital in Boston. Two hundred of these patients were treated prior to 1906 in a fairly well ventilated ward. After 1906 all patients were treated out of doors. Cunningham concludes that the results of open air treatment have not come up to expectation and that the death rate is slightly higher than before the cold air treatment was instituted. The patients were formerly treated in a ward which was well ventilated with a good grade of fresh air, although it was warm. Empyema has been slightly more frequent under the cold air treatment. Before 1906 the duration was 9.1 days. Since then under the cold air treatment it has been 8.7 days.

These statistics are interesting in view of the almost general use of cold air in treatment of pneumonia.

Freeman,<sup>26</sup> on the other hand, states that it is an accepted fact that fresh air increases the appetite and digestive power, and in spite of its doubtful effect on the blood pressure he believes that fresh air is of the greatest value. In his twenty-five cases of lobar pneumonia there were only 12 per cent. of deaths, and in the uncomplicated cases only 4.7 per cent. In sixty-two cases of bronchopneumonia there were 16 per cent. deaths and in the uncomplicated only 3.3 per cent.

Morse and Hassman<sup>27</sup> have made a large number of blood pressure readings on children with pneumonia in an attempt to verify the work of Howland and Hoobler. They found that the temperature of the surrounding air had no effect on the systolic, diastolic and pulse pressures. The temperature of the surrounding air seemed to affect the pulse rate, however, the pulse being lower out of doors than in the ward. The same is true of the rate of respiration, although there were many exceptions to both of the latter observations.

The general impression of the physicians and nurses was that the children were more comfortable outdoors than in the ward. They coughed less, were quieter, had a better color and took their food better out of doors.

No conclusions are justified at present as to the effect of the cold air treatment on the mortality in pneumonia.

#### PLEURA

Gittings, Fetterolf and Mitchell<sup>28</sup> have found that the fissures of the lungs show practically the same relation to the bony framework of

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25. Cunningham, A. R.: *Boston Med. and Surg. Jour.*, 1916, clxxiv, 753.

26. Freeman, R. G.: *Am. Jour. Med. Sc.*, 1916, cij, 1.

27. Morse, J. L., and Hassman, D. M.: *AM. JOUR. DIS. CHILD.*, 1916, xii, 445.

28. Gittings, J. C., Fetterolf, G., and Mitchell, A. G.: *AM. JOUR. DIS. CHILD.*, this issue, p. 579.

the chest in infants as in adults. The variations are considerable, but do not depend on any anatomic character of the chest, and therefore cannot be predicted from the shape of the chest. The lower level of the lungs is not quite so low as in adults, and hence great care must be taken to avoid injury to the diaphragm in thoracentesis. The lowest safe point is in the fifth or possibly the sixth space in the midaxillary line, and the seventh or possibly the eighth space in the line of the angle of the scapula. The optimum point of puncture is the seventh space in the posterior axillary line.

Bayne-Jones<sup>29</sup> reports a case of pleural eosinophilia following pneumonia. The case presented no unusual features and was a pneumococcus infection of Type II. It was followed by pleural effusion. The fluid was sterile. It contained 580 to 600 cells, of which 6 per cent. were polymorphonuclear and 45 per cent. eosinophils. The blood contained only 1.2 per cent. eosinophils. Pleural eosinophilia is a comparatively rare condition, but is probably more common than is usually thought to be the case on account of the failure to stain the smears with polychrome stain. Bayne-Jones has found an incidence of from 1 to 5 per cent. of a series of patients who were examined carefully in regard to this point. It has been reported in eight cases following a lobar pneumonia. It has been found in a long line of diseases, including practically every cause of pleural effusion. There is no relation to the cytologic formula of the other cells in the fluid, or to its sterility. It has no diagnostic significance except that the effusion is usually non-tuberculous. The prognosis is good, since these effusions are nearly always transient and benign. The only explanation offered is that it is possibly a local anaphylactic reaction, from the splitting of the proteins occurring during the process of resolution and absorption.

#### EMPYEMA

Brown<sup>30</sup> says that the recognition of pleural disorders by the Roentgen ray is rendered difficult by the fact that in acute pleurisy, especially if complicated by pneumonia, the patient cannot be brought to the Roentgen-ray plant. A portable outfit is necessary and the portable fluoroscopic outfit is simpler than that necessary for the making of plates. In the acute stage the fluoroscope detects changes from the normal physiologic motion of the lung. In the subacute and chronic cases of chronic adhesive pleurisy, after operation for empyema the Roentgen ray determines the amount of thickening of the pleura and the amount of available lung tissue beneath. These facts are more difficult to determine by ordinary physical examinations.

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29. Bayne-Jones, S.: *Bull. Johns Hopkins Hosp.*, 1916, xxvii, 12.

30. Brown, P.: *Boston Med. and Surg. Jour.*, 1915, clxxiii, 804.

It is possible by the Roentgen ray to watch the expansion of the lung damaged by an empyema, and it is especially gratifying to observe the results of treatment.

Gorter<sup>31</sup> reports two cases of interlobar empyema cured by a simple puncture. The first was a child of 15 months who had had fever for five months, following measles and bronchopneumonia. The child had cough constantly and had difficulty in breathing, anorexia and loss of weight. On examination the child was thin, pale and dyspneic. The lungs showed dulness in the right interscapular region which extended downward obliquely to the right and reached the liver dulness in mid-axillary line. Over this area there was tubular breathing and moist râles. The Roentgen ray showed a corresponding shadow. Leukocytes, 24,000. Puncture in the sixth space withdrew, at a depth of 4 cm., 10 c.c. of greenish pus containing pneumococci. Following this there was a rapid recovery and the disappearance of the sign.

The second case was in an infant of 5 months who in the course of pertussis had bronchopneumonia lasting fifteen days. One month later a fever of intermittent type was noted, caused by purulent pleurisy on the right side. Eighty cubic centimeters of pus were withdrawn and a staphylococcus was found. The temperature continued after this, running from 99 to 102 F. Twenty days after the first puncture examination showed a normal lung at the apex and base, but dulness and tubular breathing in the interscapular region. The Roentgen ray showed a shadow which corresponded to this. Von Pirquet negative. Puncture of the sixth space in the scapular line permitted withdrawal of 10 c.c. of pus at a depth of 6 cm. After this the temperature fell gradually and the signs disappeared. Gorter explains the good effects in interlobar effusions by the relaxation of the tension in the sac caused by withdrawing the fluid. These effusions are usually well walled off from the general pleural cavity, and if recognized, the prognosis is good.

Gerdine<sup>32</sup> made a study of pleural effusions occurring during the acute stage of pneumonia. In six out of fifteen cases the fluid was discovered before the crisis. Most of these fluids were sterile, slightly turbid, containing a large number of leukocytes, mostly polymorphonuclear.

He believes that this type of parapneumonic empyema is usually, but not always, of a benign type, that it occurs frequently, and can be demonstrated by the Roentgen ray, physical signs or puncture. It does not alter the course of the pneumonia. True pus is present more rarely and may contain virulent organisms. The degree of virulence of the organisms, determined by animal inoculations, seems to be of prog-

31. Gorter, E.: *Arch. de méd. d. enfants*, 1916, xix, 317.

32. Gerdine, L.: *AM. JOUR. DIS. CHILD.*, 1915, xi, 33.



nostic value. Surgical interference should only be considered when the organisms found are of high virulence.

It is evident that operation on a child with pneumonia who has a small collection of sterile fluid in the pleural cavity is not justifiable. Operation should be postponed until after the crisis of the pneumonia, unless the amount of pus is large or the organisms are virulent.

Bertoldi<sup>33</sup> reports two cases of pyopneumothorax in infancy. The first was in a child of 3½ years who was found to have signs of pyopneumothorax, was operated on and died. Necropsy showed a foreign body at the bifurcation of the left bronchus, bronchopneumonia and a small abscess, with a perforation of the pleura. The second case was a 15 months' infant who had a pneumococcus infection resulting in pyopneumothorax and death. The diagnosis was made by the Roentgen ray. Bertoldi advises operation as the only hope in these cases, but only in the nontuberculous variety.

In discussing the pneumodynamics of empyema, Cotton<sup>34</sup> says that the intrapleural pressure is determined by the positive pressure in expiration and the negative pressure in inspiration, the elasticity of the lung, lymphatic absorption, and the surface tension of the great pleural surfaces tending to preserve contact of the lung with the chest wall. The last factor is sufficient in itself to prevent collapse of the lung if the pleura is only slightly torn. With larger wounds the lung contracts unless held by adhesions. When a chest full of fluid is opened the lung does not collapse at once. On the contrary, the fluid is expelled in a jet. This is caused by the cough excited by the pleural reflex. The lung usually expands at first but collapses within a few hours. With a proper dressing the lung does not collapse at all, and therefore in a double empyema a proper valve dressing makes it possible to operate on both sides at the same time. The factors determining lung collapse are the previous collapse and lung compression by the fluid, free access of air, respiration with partial closure of the glottis and an accidental valve action at the wound. Cotton believes that any positive pressure apparatus is dangerous, since this is not the proper way to expand the contracted lung.

Proper drainage is the most important factor and is the true way to prevent collapse. It is important to remove the fibrin masses at the time of an operation to prevent plugging of the tube. The rib resection must be one-half to three-fourths of an inch long so that the finger may be inserted and the fibrin swept or fished out. The patient may be turned so that the wound is directed downward, and coughing will

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33. Bertoldi, M.: Thèse de Buenos Aires, 1915; ref. in *Arch. de méd. d. enfants*, 1916, xix, 167.

34. Cotton, F. J.: *Boston Med. and Surg. Jour.*, 1916, cixxiii, 804.

often expel the fibrin. Cotton believes that irrigations are dangerous and should not be used. Drainage is promoted by whatever best aids expansion of the lung. Most cases of empyema get well by accident, because the wet, pus-soaked dressing acts as a fair valve. Cotton uses a square of rubber tissue held taut at the corners by adhesive strips. A little glycerin is run between this and the chest wall. The drainage tube is put through a tight opening in the center of this and negative pressure is applied by means of a column of water which causes a suction through an arrangement of bottles. The water column should not be over 10 inches high, since a stronger suction than this is dangerous and may cause pleural hemorrhage. Blow bottles are very useful to promote expansion of the lung. Decortication operations are rarely necessary.

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