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Publication/Creation

Edinburgh : Oliver and Boyd, 1886.

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THE
BRONCHIAL CATARRH OF CHILDREN.

BY

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*(Read before the Medico-Chirurgical Society of Edinburgh, 7th April
1886.)*

PRINTED BY OLIVER AND BOYD, EDINBURGH.

MDCCCLXXXVI.

R26462

REPRINTED FROM THE EDINBURGH MEDICAL JOURNAL FOR OCTOBER AND NOVEMBER
1886.

THE BRONCHIAL CATARRH OF CHILDREN.

THE liability of children to catarrhal complaints is one of the leading characteristics of disease in early life. The bronchial catarrhal affections stand out prominently in this country as among the commonest and most fatal of the diseases we meet with in pediatric practice. Healthy children are liable to be thus affected under a variety of circumstances, still more so are those debilitated from whatever cause, either acute disease or constitutional depravity. In rachitic children particularly such ailments are frequently met with, and are apt to become intractable and dangerous.

I purpose giving a short sketch of the clinical features and complications of bronchial catarrh in children, and offering a few remarks on the general management and therapeutic treatment of the various conditions. In doing so, I limit my observations chiefly to acute primary or idiopathic bronchial catarrh occurring during the dentitional or pre-dentitional periods of infant life. It is at these epochs that we meet with the peculiarities which distinguish the disease at this time from that occurring in childhood or adult life, and which invest it with such special interest and importance. It is well known that in the extremes of life there is a greater liability to bronchitis than there is in the adult or middle period. The hypersensitiveness and activity of the mucous surfaces in children render them specially liable to such affections, doubtless in obedience to the law of evolution of disease, which holds that organs and tissues are prone to disease in direct proportion to their normal or physiological activity. In healthy children we are fairly entitled to say that there is relatively a greater proneness to the production of such diseases than in adults. In the case of children debilitated from various causes there is even a more marked predisposition to such affections.

Among the causes which tend to produce bronchial catarrh, *climatic influences*, in this country, stand out prominently. Frequent and sudden changes of temperature, and cold and damp winds, must be credited largely in its causation. After epi-

demics of hooping-cough or measles there is a special disposition to pulmonary and bronchial attacks, especially during winter and spring.

Anti-hygienic conditions likewise play a not unimportant part in this connexion, by lowering the tone of the system and depressing the vital powers, thereby diminishing the ability of the child to resist the exciting causes of the disease. Associated with these, the next cause deserving of note is *deficient or improper clothing*. This, no doubt, operates in a large number of cases, and although it is chiefly among the poorer classes, mothers in better circumstances are not altogether free from blame in this respect. It has always appeared to me a barbarous custom that infants should be dangled about with bare arms, and after they are short-coated with bare legs also. Nothing can be said in favour of the custom, except that it has been to a great extent the fashion, and that it panders to the vanity of mothers who are proud of displaying the natural beauty of their children. Surely common-sense would dictate that infants are at least as liable, we believe more so, than adults to catch cold by having their extremities exposed. During the *dentitional period* children appear to be specially prone to catarrhal attacks. At this time the physiological activity of the process is concentrated in the buccal cavity, and with this the gastro-intestinal and bronchial mucous membranes show a close sympathy. One of the most frequent conditions with which bronchitis is associated is *rachitis*. Here the defective state of nutrition of the body generally and lowered nerve tone are important elements, no doubt, in causation, and if, in addition, we have softening and deformity of the bony walls of the chest, all the conditions are present which interfere seriously with the physiological activity of the lungs, inducing more or less blood stasis and passive congestion, along with which is sooner or later associated a more or less chronic catarrhal condition of the bronchi, and often pulmonary collapse.

The clinical features of bronchial catarrh in the child necessarily vary according to its previous condition, and the extent to which the bronchial tubes become involved. The disease often begins, as in the adult, with a coryza, and spreads by continuity of surface to the tracheo-bronchial mucous membrane. As a rule, the symptoms of bronchitis are better marked or more acute in a previously healthy child than in a cachectic one, in whom the complaint is often of a sub-acute and insidious character. In acute cases cough is generally a prominent symptom. At first hard and dry, it soon becomes loose, as the secretion from the inflamed bronchi is established. The child does not perhaps otherwise show signs of illness. There may, however, be only a slight cough, and even no rise of temperature. The child may be lively and happy with its playthings, and the disease go on unheeded till the medium-sized and smaller tubes are affected, when the symptoms all become aggravated. It is in these circumstances that the practitioner is generally

called in to see the child. The physical signs in the slighter forms of the disease are generally limited to a somewhat harsh vesicular respiratory murmur, accompanied by a few sibilant rhonchi heard chiefly in the inter-scapular region. The temperature seldom rises much above normal; the pulse and respirations are only slightly, if at all, accelerated. Very different are the symptoms and physical signs when the bronchial tubes are more extensively involved. Then we have all the features of bronchial catarrh well marked: hurried respiration, varying from 40 to 50; accelerated pulse; temperature ranging from 99° to 101° or higher, pretty regular, and not characterized by great remissions. The physical signs are generally characteristic. During the first few days the respiratory murmur is high pitched and often harsher than natural, with few accompaniments other than those of a dry character. These signs are soon succeeded by crackling mucous *râles* heard generally over the chest, both during the inspiratory and expiratory acts. These mucous *râles* are the most characteristic sign of



FIG. 1.—Bronchial Catarrh severe, uncomplicated Recovery.

extensive and fully-developed bronchitis in the child, and are relatively more copious and frequent than in similar conditions in the adult. They are heard, as a rule, generally over the chest, but most numerous posteriorly in the mid-scapular regions and at the bases of the lungs. In a previously healthy child such a condition as this, under careful treatment, may end satisfactorily in from ten to fourteen days, the physical signs gradually disappearing and convalescence becoming established. In a delicate child, or in any case where the disease does not show signs of amelioration within a reasonable period, the case may either become chronic, or extend to the minutest bronchial ramifications, in which case the symptoms assume a more severe character, and serious complications are apt to arise. When *capillary bronchitis* becomes developed

there is an aggravation of all the symptoms. The pulse is much accelerated, the respirations run up to 50 or 60, or even higher, the countenance becomes dusky and livid, and the *alæ nasi* act visibly, the cough at the same time is more frequent and distressing, the mucous *râles* more copious and general. Signs of gastrointestinal disorder are generally present,—a coated tongue, unhealthy evacuations, often diarrhœa. The greater tendency of the catarrh to extend to the minute bronchi, and the almost inevitable occurrence of further complications, are leading characteristics of, and constitute the great danger in, this disease in children. The complications likely to arise as a secondary result of bronchial catarrh invest the disease as occurring in early life with peculiar interest, and it is to warding off these that all our efforts as physicians should be directed. The complications alluded to, I need hardly say, are pulmonary collapse, with its compensatory emphysema and catarrhal pneumonia.

A consideration of the clinical features of pulmonary collapse will, therefore, naturally engage our attention. Acquired atelectasis, as it is called, is of common occurrence—perhaps more frequent than is generally supposed, except by those who are much engaged in the treatment of disease in children. It is a condition which is generally associated with the more extensive and severe forms of bronchial catarrh, but is not unfrequently met with in young children even in the milder forms of the disease. Perfect recovery and reinflation of the collapsed lobules may take place. On the other hand, these portions of lung may either remain in a permanently atelectic condition, or catarrhal pneumonia be ultimately developed in them. An early recognition of the occurrence of collapse is of primary importance, as prompt and energetic treatment is successful in a certain proportion of cases in inducing reinflation, and preventing the occurrence of further complications. The causes of pulmonary collapse are mainly of a physical nature. It may be stated generally that anything which mechanically interferes with the normal mechanism of the respiratory act in a child will tend to produce it. In considering the etiology of this condition it is desirable to allude, in the first place, to the pathology of cough. Cough, being essentially a reflex and involuntary act, may be considered salutary in so far as it assists nature to clear the tubes and get rid of viscid or irritating mucus. In the adult this involuntary act is largely supplemented by voluntary effort: in the young child such is not the case, and the patient is placed at a distinct disadvantage so far as the extra effort is concerned. There can be no doubt that the absence of this voluntary power is a not unimportant factor or link in the chain of causes tending to induce pulmonary collapse. In enumerating the causes of defective breathing power, we must look to the entire respiratory apparatus, and here, we find, that in any part of it altered physical conditions may arise which tend to produce atelectasis. Thus, in the

chest walls, in the abdomen, in the nares, larynx, trachea, or bronchi, we may meet with conditions giving rise to it. Weakness

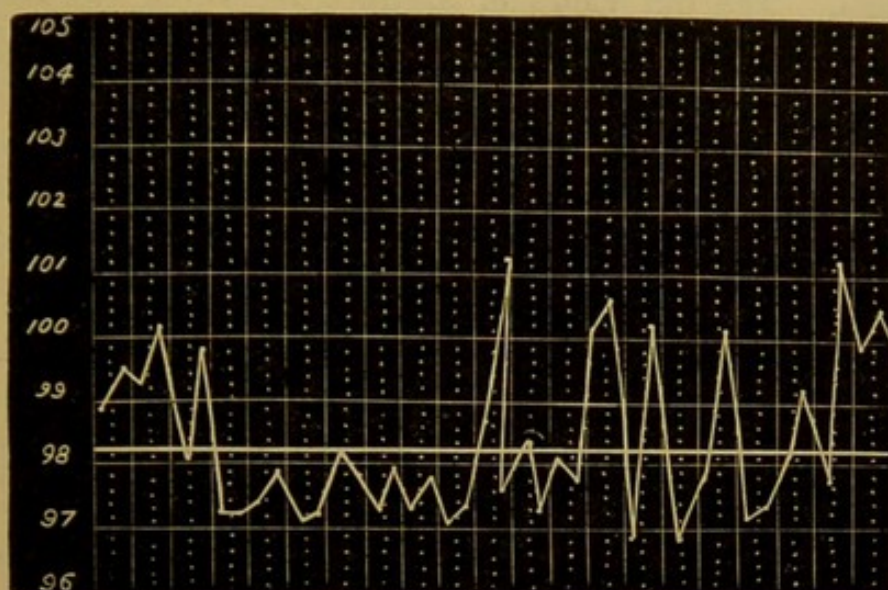


FIG. 2.—Bronchitis; Pulmonary Collapse; Catarrhal Pneumonia in a child 14 months old. Low temperature range indicates period of collapse.

of the thoracic parietes, whether of bones or muscles, and associated with this, a general condition of debility and loss of muscle and nerve tone, as seen in rachitic children, in whom, when there is any bronchial catarrh, as there generally is, and when this is associated with a loss of rigidity in the bony framework of the chest, you have pulmonary collapse to a greater or less extent almost invariably present. In like manner, when from whatever cause the abdomen is distended, we have, as a natural result, an obstacle to the free descent of the diaphragm, and consequent weakening of the inspiratory act, which acts directly in the production of collapse. Nasal or laryngeal or tracheal, as well as bronchial stenosis, from whatever cause, will likewise tend to produce it. Thus, in croupous or diphtheritic laryngitis, or laryngismus stridulus, we meet with it. Before alluding to causes in the bronchial tubes themselves, I wish merely to refer in passing to the question, which the limits of the paper forbid my discussing, how far any or all of these causes may operate in the production of collapse without the concomitant existence of bronchial catarrh. There are grounds for believing that in atrophied and debilitated children, with rickety deformity of the chest, atelectasis may be gradually and slowly produced by physical causes apart from any intra-bronchial plugging or occlusion. There can be no doubt, however, that in the larger proportion of cases bronchial catarrh pre-exists, and, as a result, gradual blocking of the tubes with secretion directly causes collapse. The pathology of "plugging" of the tubes, as it is called, has been carefully worked out ever since Lænnec opened up the subject in his classical writings.

I need only mention the names of Hutchinson, and of Gairdner,¹ who, in his excellent monograph—a model of exact clinical and pathological observation—has clearly shown the mechanism of its production. The old views of Lænnec regarding the relatively weaker power of the expiratory as compared with the inspiratory act have been disproved by almost all observers since his time. Hutchinson and Mendelsohn² prove conclusively that the forced expiratory act is one-third more powerful than the inspiratory act. This fact, as proved also by Gairdner and Traube, is one of the most powerful factors in the production of pulmonary collapse, especially when the bronchial tubes are obstructed by secretion.

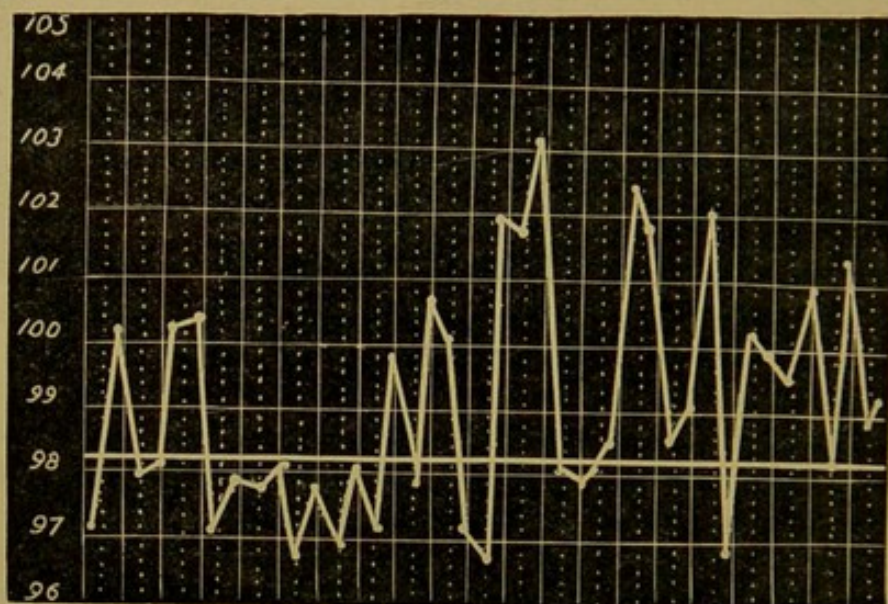


FIG. 3.—H. M., æt. 2; Acute Bronchitis; Collapse; Catarrhal Pneumonia; Death.

The “plug” theory of Gairdner has been abundantly proved, and presupposes the existence of viscid mucous plugging up the tube at a particular part. There can be no doubt that when we have viscid or partially solidified secretion occluding a tube of greater or lesser dimensions, the mechanical effect is such, that during the coughing and respiratory acts, the mucus acting in a valvular manner, allows more readily the exit than the entrance of air into the alveoli, which ultimately become atelectic. Judging from a large number of cases of pulmonary collapse in children in which I have examined the bronchial tubes, they have been almost invariably filled with fluid mucus of a more or less viscid nature, so I am inclined to think that, in children at all events, the consistency of the mucus is generally fluid, seldom inspissated to such an extent as to form the more or less solid plug graphically described by Gairdner, and that collapse takes place from a slow damming up of the tubes, the air being gradually forced out by the relatively stronger expiratory power, or the entrance of air prevented, in which case that contained in the alveoli is gradually absorbed,—a result which, we know from the observations of Fuchs, is almost

¹ *Pathological Anatomy of Bronchitis.*

² Reid, *Resp. Cyclopd. Anat. Phys.*, Part 32, p. 336.

certain to be brought about. The secretions in the bronchial catarrh of children are generally believed to be relatively more copious and fluid than in adults. Whatever be their condition, the same result obtains with probably equal facility.

The only other cause of pulmonary collapse to which I shall allude, is the probability of the temporary occlusion, partial or complete, of the smaller bronchial ramifications by spasmodic contraction. Lænnec, and after him Trousseau, and most other writers on the subject, have alluded to this. Trousseau, in proof of the existence of this contraction, has found therapeutically that belladonna, from its well-known action on the vagus in lessening vascular congestion of the mucous surface, diminishing secretion, and relieving spasm, is a most efficient drug in treating such cases. In young children, especially those in previously good health, and in whom reflex nerve action is excited with great readiness, it seems probable that this is not an unimportant factor in the production of pulmonary collapse, especially the slighter form of the complication. In fact, it is difficult to account for its production except on some such theory in the slighter forms of the disease, when there are no signs of any secretion in the tubes. The exact conditions and relations of the bronchial muscles in acute catarrhal conditions require elucidation. One cannot doubt that reflex spasm, as is generally supposed, must seriously affect the ingress and egress of air. A further development of the spasm, ending in more or less paralysis of the muscular wall, especially if accompanied by swelling of the mucous membrane, would tend to produce the same effects.

In a paper read to this Society lately by Dr M'Bride,¹ he alluded to the recent interesting observations of Huck on the erectile tissue of the inferior turbinated bodies in the nose. Stenosis of the nares in young children often plays an important part in the production of pulmonary collapse. Nasal catarrh is of common occurrence in infants, and is directly dangerous in proportion to the rapidity and completeness of the occlusion. It is still a debated point whether erectile tissue exists in the bronchial tubes. If it does, there can be little doubt that it would readily account for the rapid temporary closure of the tubes which occurs in the slighter forms of bronchial catarrh in comparatively healthy children.

I have said enough regarding the etiology of this condition to show that the causes are various and often complex. The importance of a thorough appreciation of these is obviously necessary in view of any rational treatment of the disease. What, then, are the clinical features of these cases? How do we recognise them during life? From what has already been said, it will be obvious that we meet with varying degrees of pulmonary collapse, from atelectasis of a limited number of lobules (lobular collapse) to that of larger portions of lung (lobar collapse). As would naturally be

¹ *Medico-Chirurgical Transactions*, vol. iii.

expected, the symptoms vary much in intensity according to the extent of lung involved, and the pathological conditions otherwise accompanying it. The clinical recognition of this complication is usually easy in direct proportion to the amount of lung involved, and the rapidity with which the collapse takes place. In those cases in which it is slowly and gradually induced, we do not meet with those well-marked symptoms which obtain when the child is *suddenly* deprived of the use of a portion of lung. The cases can readily be divided into two classes:—

A slighter form, occurring often in otherwise healthy children suffering from mild bronchial catarrh. In such cases the symptoms and signs are often comparatively neither serious nor pronounced, and may frequently be overlooked or misinterpreted. When recognised and suitably treated, inflation of the collapsed lobules takes place and the child recovers. Perhaps I can best illustrate the clinical features of the slighter form of pulmonary collapse by referring to one or two cases in point.

In December last year I was asked to see, in consultation with a medical practitioner, a bottle baby about four months old. The child had been ill for a week with slight symptoms of bronchial catarrh, the older children in the house all having had cold about the same time. The baby had previously presented no serious symptoms except slight sneezing and cough, with restlessness and intermittent suckling, and no constitutional disturbance otherwise. The night before I was asked to see the infant it had turned suddenly worse, becoming heavy and drowsy, refusing the bottle, the breathing being somewhat accelerated. On examination I found the child breathing 80 per minute; pulse, 130; temperature, 99°; anterior fontanelle somewhat depressed; superficial veins of head and anterior part of thorax prominent. On inspection of the chest, there was little movement and no indrawing of the ribs during inspiration at any part, the respiratory movement being chiefly abdominal. On auscultation the breathing was loud and freely audible all over the chest, and accompanied by occasional and scattered sibilant sounds, except over a limited space about 1½ inch square on the right side posteriorly near the base, where the breathing was faint and feeble, and the percussion resonance slightly impaired. I ordered the infant, as it had ceased to take its bottle, to have a tablespoonful of sac whey every hour and a half, for which it was to be wakened out of sleep, and, if possible, made to cry; sudden cold applications, if necessary, to the chest; to lie on the sound side; and a light cotton wool jacket to envelope the chest, and the flannel binder to be removed from the belly; ℥v. of sp. ammon. arom., with ℥j. of sp. chloroform, to be given every two hours alternately with the food. In two days the child had resumed its natural appearance and begun to take the bottle, the breathing became louder and stronger over the affected part, and a few fine crackling râles could now be heard, which soon disappeared.

A second case was that of a little girl one year old, who had been suffering from slight bronchial catarrh for about ten days. She appeared to be going on favourably, but on the tenth day I was sent for to see her, and found the breathing much accelerated. Previously the respirations had been hardly above normal, but now they numbered 68 per minute, the pulse being 130, temperature $99^{\circ}.2$. Examination of the chest showed scattered sibilant rhonchi, with occasional crackling in the interscapular region and towards the bases of both lungs. The respiration was exaggerated at parts, and generally of unequal intensity, but no definite localized signs of pulmonary collapse could be detected. The existence of lobular collapse was, however, diagnosed as probable, and the further progress of the case corroborated this. The chest had been previously covered with a cotton wool jacket. A liniment of ammonia and camphor was ordered to be applied. She was given two ounces of milk, with a few drops of brandy and six drops of tr. belladonna, every three hours, for which purpose she was to be roused from sleep if necessary. In four days the aggravation of symptoms had disappeared, the respirations coming down to 40. The only alteration in physical signs was the occurrence of copious crepitant râles over a limited area towards the base of the right lung posteriorly. She got rapidly well. Such cases as these are not unfrequently met with. Many may be diagnosed with certainty from the occurrence of well-marked physical signs along with the usual symptoms. In others the physical signs are either absent or at first indistinct, yet the general features and termination of the case leave little doubt as to the existence of limited pulmonary collapse. The danger in all such cases, especially if they are unrecognised and not treated, is the occurrence of catarrhal pneumonia in the collapsed patches.

The second and more serious form of pulmonary collapse is met with in the severer forms of bronchial catarrh, in which the collapse is generally more extensive, and the symptoms and ultimate result of the complication much more serious. In such cases the reinflation of the collapsed lobules is the exception and not the rule. In capillary bronchitis in young children this complication is of great frequency, and generally leads on to catarrhal pneumonia. So common is its occurrence, that I believe you rarely meet with cases in which the ultimate bronchial ramifications are involved in an infant without the existence of collapse to a greater or less extent. It may be very limited, and, as in the milder form of catarrh, affect a few scattered lobules, or it may involve large portions of lung substance. In the former case the symptoms are less prominent, and physical signs are usually absent; in the latter the condition gives rise to well-marked symptoms, and frequently the physical signs are distinct.

The symptoms of extensive pulmonary collapse are prominent *in proportion to the rapidity with which the collapse takes place.* In

cases where the air is slowly expelled from the alveoli, by gradual occlusion of the smaller tubes, there are often no marked symptoms; on the other hand, when, from whatever cause, the collapse is sudden, as when a large bronchus becomes plugged, the symptoms present a more marked character and admit of easy recognition. In such cases, what are the clinical features of the disease? In a case of extensive bronchitis, when rapid lobar collapse takes place, there is usually a marked change in the symptoms. The child becomes greatly distressed, often more restless; the countenance is anxious, the lips livid, the alæ nasi move actively; the respirations become more hurried and shallow, frequently as high as 70 to 80 per minute; the pulse is small and compressible. The pulse respiration ratio is markedly perverted. The temperature does not, as a rule, show a corresponding rise; in some cases there may be a fall. The cough becomes markedly altered in character and frequency, is sometimes almost suppressed; at all events, it loses its harsh bronchial character, and becomes much more feeble and shorter. The child generally refuses food; if at the breast it stops sucking altogether. Along with these symptoms the physical signs become altered. During inspiration there is more or less indrawing of the ribs and intercostal spaces over the lateral aspect of the chest on one or both sides. There is high pitched percussion resonance, often well-marked dulness over the base of one or both lungs, or along the line of the spine. The percussion dulness is, however, often masked by the emphysematous lung around the collapsed portion, so that we sometimes get a hyper-resonant note rather than a dull one. On auscultation the breathing is shallow and feeble, and generally of a faintly bronchial character. There are usually no respiratory accompaniments at first, other than those previously audible, but in the course of a day or two fine crepitant râles may be heard from the congested lung substance in and around the collapsed portion. In the further progress of such cases, one of three things is likely to happen. As I have already said, in lobar collapse in severe bronchial catarrh reinflation rarely takes place to any extent. The collapsed portion may remain *in statu quo*, the child may die suddenly, or catarrhal pneumonia may be set up.

I now pass on to the consideration of acute catarrhal pneumonia. No more interesting class of cases is met with in the clinical study of disease in children than these. They are of interest, not only from their frequency, but on account of the variation of the symptoms, and the inconstancy of the physical signs as compared with similar conditions met with at later periods of life. No one who has not given close attention to the clinical features of these cases in early life would believe how variable and rapidly changing are the physical signs of pneumonia in the child. Well-marked signs of consolidation may be present one day, which from alteration in the physical conditions, due perhaps to emphysema or collapse, may be

quite changed in a few hours. In children, without doubt, we meet with a true fibrinous pneumonia as well as the catarrhal form of the disease, with symptoms and physical signs so distinct as to leave no

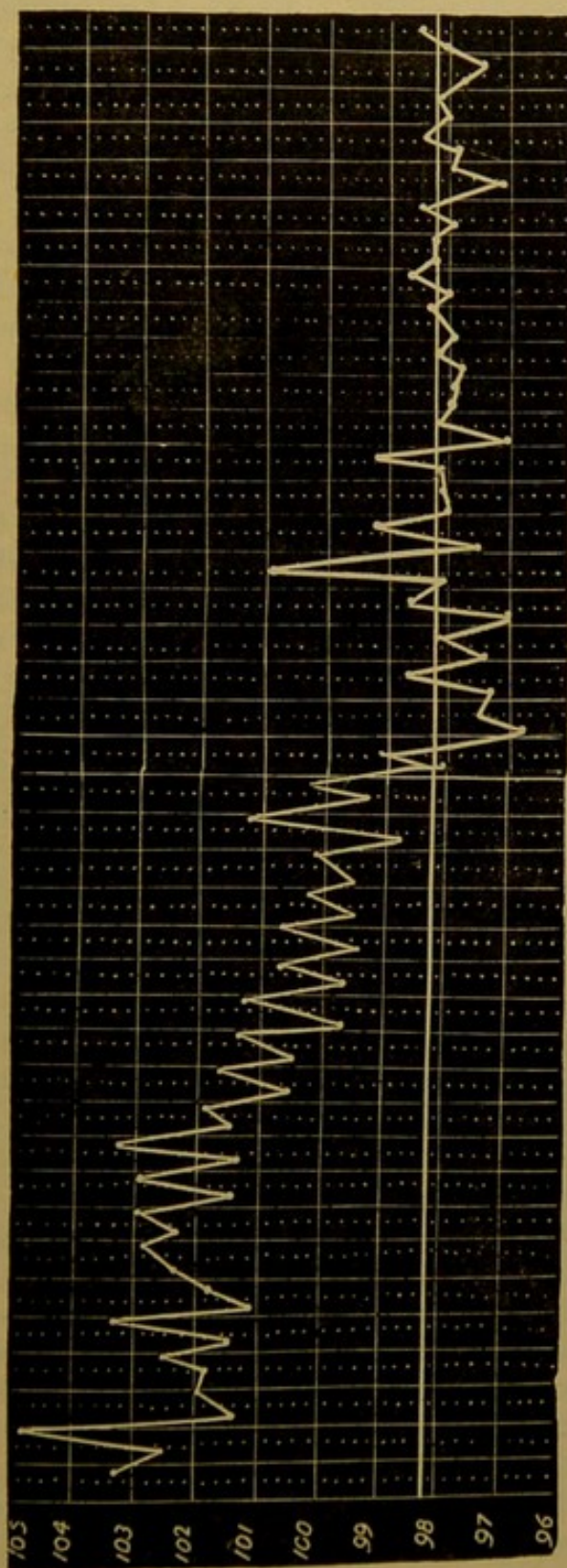


FIG. 4.—J. D., aet. 7. Acute Catarrhal Pneumonia; Recovery.

doubt as to its exact nature, but there is a large class of cases where, clinically, the line is by no means easily drawn between the two diseases. The old distinctions between lobar and lobular pneu-

monia are of comparatively little value in the child, as we meet with cases of lobar catarrhal pneumonia which at first sight, at all events, are not so readily distinguished from the croupous variety of the disease. All observers are agreed that the acute catarrhal pneumonia of childhood is essentially a disease of early life. What, then, are its distinguishing characters? The first fact to lay hold of is, that it is a secondary disease, closely associated with, generally complicating, bronchial catarrh. It occurs during the progress of this disease especially when the ultimate bronchial ramifications are involved. Clinically it is difficult, often well-nigh impossible, to distinguish between capillary bronchitis and acute catarrhal pneumonia. Probably capillary bronchitis rarely occurs in a young child uncomplicated by catarrhal pneumonia. The recognition of the occurrence of this complication, as a rule, presents few difficulties. The previous existence of bronchial catarrh itself, if extensive, affords strong presumption of its occurrence. The diagnosis may be assured by a consideration of the general clinical features of the case, more particularly as regards symptoms, physical signs at the commencement, and when the disease is limited in extent, and possibly confined to a central portion of lung, being often indistinct in their character. When larger portions of lung are involved the physical signs are well marked, and give clear indication of the true nature of the complication.

I have already sketched the symptoms of bronchial catarrh, whether of a slight or severe character, and in order to a recognition of the occurrence of catarrhal pneumonia it is necessary to keep them in remembrance, and to note the changes in the clinical features of the case which the supervention of catarrhal inflammation of the alveoli gives rise to. Let us, by way of illustration, again picture the case of child suffering from extensive bronchial catarrh. The hurried breathing, the constant harsh cough, often paroxysmal in its nature, the accelerated pulse, the anxious and distressed look, the disinclination for food or playthings, the foul tongue, the unhealthy stools, the more or less frequent vomiting of undigested food and mucus. All the while the temperature is not very high, ranging from 99° to 101° , with no great variation, its ratio to that of the pulse being pretty constant. Let us note the changes which take place in the supervention of catarrhal pneumonia. Its onset is signalized by a marked change in the symptoms from those of the ordinary bronchial catarrh which has preceded it. Probably one of the first noticeable alterations in the symptoms is the cough, which invariably changes its features. It loses its purely bronchial character, and becomes shallow, short, and hacking, and apparently accompanied by pain during the act. The cough may be more frequent—often very constant—and irritating, but sometimes one of the most characteristic features is its diminished frequency. At the same time the respirations are much accelerated and shallower than before, running up to

50 or 60, or even more, in the minute—the *alæ nasi* acting rapidly. The pulse becomes much quicker, and its ratio to the respirations markedly perverted. The temperature rises to 103° or 104° , or even higher, and at the same time alters as regards its type. From the comparatively regular temperature of bronchitis it becomes markedly of an irregular type with decided remissions, the rise generally occurring in the evening with considerable morning fall. In no class of cases is the graphic method of recording temperatures of more value, as by it alone we can often diagnose the supervention of catarrhal pneumonia. The child lies quietly and does not cry so much, nor does it resist physical examination to the same extent as before. This is always a serious sign in acute lung affections in the child. There is generally considerable disorder of the digestive functions of a nature already referred to in uncomplicated severe bronchitis. The physical signs next demand our attention. We can generally acquire valuable information in these cases by simple inspection of the chest. In normal respiration in young children, what strikes the observer at once is the comparative absence of thoracic movement as compared with the adult, the respiration being chiefly abdominal. In collapse of the lung and catarrhal pneumonia the movements of the thoracic

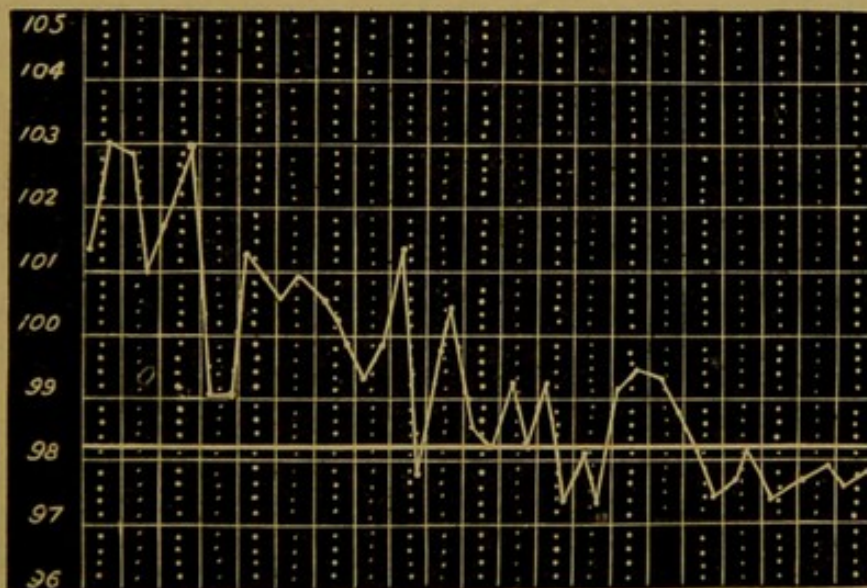


FIG. 5.—Acute Catarrhal Pneumonia in a Child, aged 2; Recovery.

walls are generally characteristic, the indrawing or retraction of the ribs and intercostal spaces during inspiration being distinctly marked, more especially in rickety children, where the softness of the bony framework of the chest brings this into greater prominence. The retraction is noticed chiefly in the lower lateral parts of the chest. On auscultation and percussion the signs vary very much according to the extent of the disease, the number of lobules affected, their contiguity to one another, and their proximity to the chest wall. In some cases where the patches are small and not

near the surface, the signs of consolidation are not well marked or altogether absent, and we are forced to base our diagnosis on symptoms alone, which, if they are of the characteristic nature already described, leave little doubt as to the true nature of the case. As a rule, however, physical signs are sufficiently distinct. The percussion note loses its natural resonance, and becomes impaired in proportion to amount of consolidation and the proximity of the patch to the surface. Where much healthy lung substance or surrounding emphysema intervenes between the consolidated portions and the surface, the resonance may appear natural or little impaired. On auscultation crepitant *râles* are heard accompanying both inspiration and respiration. These are very different and much coarser than the fine crepitation heard at the end of the inspiratory act in croupous pneumonia. The *râles* persist during the whole course of the disease, and do not disappear, as in croupous pneumonia, at its height. The respiration is usually of a broncho-vesicular character, and the voice resonance intensified.

Catarrhal pneumonia, unlike the croupous disease, is of indefinite duration, without any distinct crisis. The further progress of such cases is generally characterized by the more pronounced nature of the symptoms. The physical signs usually become more distinct as the pneumonic areas enlarge or coalesce. When the child recovers it does so slowly, a gradual improvement in both symptoms and physical signs becoming manifest. If within a fortnight there are no signs of abatement, the case generally runs a subacute course, and may terminate favourably at the end of six or seven weeks; or the disease may become chronic, convalescence being indefinitely delayed; or it may be ultimately complicated by the supervention of tuberculosis.

I have already referred to gastro-intestinal complication in the bronchitis of children, and shall make a few additional remarks on it before passing to the subject of treatment. I should like to emphasize the importance of the gastro-intestinal complication of the bronchial catarrhal affections of children, not only on account of its frequent occurrence, but of its danger and the necessity of early recognition and prompt treatment. A catarrhal condition of the stomach or bowels, or of both combined, is present in a large proportion of cases of bronchial catarrh. Such complications seriously interfere with the assimilation of food, and increase the febrile disturbance and general distress of the child, and often lead indirectly to a fatal termination. The catarrh is essentially secondary in its nature, and probably induced by the swallowing of the irritating secretions from the bronchial tubes. Young children, as is well known, do not expectorate but swallow the mucus, and the frequency of the occurrence of gastro-intestinal complication is, I believe, in direct proportion to the infrequency of vomiting in these cases. Every one who has had much experience of bronchial catarrhal disease in children know the relief experienced

after vomiting, the expectoration being thus removed, and an obvious source of irritation got rid of. If the child does not vomit from time to time, and bring up the catarrhal secretions which have been swallowed, a secondary catarrh is apt to be set up in the stomach, often extending into the bowels, causing indigestion and diarrhoea, with defective assimilation of food.

The usual signs of gastro-intestinal catarrh are well marked, the tongue red and thickly coated at first, sometimes desquamating afterwards, nausea, disinclination for ordinary food, thirst, vomiting, with more or less mucus sometimes streaked with blood, diarrhoea, offensive stools, deficient in bile, with undigested food and mucus, often becoming more watery as the case goes on. When there is vomiting alone, the complication is not so serious as when the catarrh has passed down the tube and you have constant diarrhoea. In any case, as I have already said, these complications add greatly to the gravity of the case.

The treatment of bronchitis and its complications must now demand our attention. At the outset, I need hardly say that a correct recognition of the exact physical condition we have to deal with in the lung is a necessary preliminary to successful treatment. I shall allude to the management of such cases under three heads—Hygiene, Diet, and Medicine—and in the order of their importance, for I believe that in this class of diseases in children the administration of drugs is of secondary importance to the details of hygienic and dietetic management, and, as in the treatment of disease in children generally, more success in practice is derived from the attention to little details than anything else. In treating of cases of pulmonary collapse I have already made reference to the treatment adopted, and, as it differs in some respects from that of ordinary uncomplicated bronchial catarrh or catarrhal pneumonia, I shall now allude to the principles on which it is generally agreed such cases should be treated. The end we desire to attain in a case of acquired atelectasis is, if possible, reinflation of the collapsed portion, and there can be little doubt that in a certain proportion of cases this can be brought about. I believe in many of those cases, examples of which I have recorded, where, in the milder cases of bronchial catarrh, the smaller tubes remain unaffected, sudden collapse occurs, prompt and energetic measures will suffice to restore the lung to a natural condition. In extensive capillary bronchitis it may be doubted whether complete or partial reinflation ever takes place. The first indication in treatment is to promote and encourage free respiration, more especially the act of inspiration. For this purpose the child's clothing must be light and loose, the abdominal bandage in infants should be removed. The child should be made to lie on the sound side in the case of one side only being affected, so as to allow the affected side full play. It should not be allowed to sleep or lie too long, such children

being often very drowsy, but should be taken up at intervals, and made to cry if possible. The nurse may be instructed to cool her hand by placing it in cold water and applying it suddenly to the chest, in order to induce a sudden inspiration. The room should not be too hot, and well ventilated. Stimulating epithems may be applied to the chest, such as hartshorn, mustard, or turpentine. The child should be fed regularly with food suitable to its age. Sucking babies often refuse to take the breast, and need to be fed with the spoon. In any case the child generally shows a disinclination for food, and only takes a little at a time, and therefore should be fed more frequently. Whatever be the age of the child, it generally requires stimulants, and a few drops of brandy, or in the case of a sucking infant sac whey, should be given. The most serviceable medicines are those of a stimulating nature, such as sp. ammon. arom., or subcarbonate of ammonia, which should be given in small doses, frequently repeated. Belladonna is undoubtedly of use in those cases of collapse occurring suddenly in slight catarrh in comparatively healthy children, more especially where we have reason to believe there is temporary occlusion of the tubes from nervous, spasmodic, or reflex causes. The drug should be given in full doses, and repeated with sufficient frequency to insure a sedative effect. Its influence in this class of cases is generally most marked in diminishing the tension of the bronchial muscles and allaying reflex excitability, thereby facilitating the ingress of air to the collapsed portions. The drug is of no use in the more serious cases of collapse occurring in capillary bronchitis accompanied by catarrhal pneumonia.

In *acute bronchial catarrh* the hygienic management first demands attention. The cot should be placed, if possible, in a corner of the room near the fire, the room must be properly ventilated, and the temperature maintained at a range of between 65° and 70°. The child's clothing should consist of a warm flannel night-dress if in bed; in the case of an infant in arms it should, in addition, be kept in a light woollen shawl or blanket extending below the limbs; the belly binder should be removed. The atmosphere of the room should be kept moist. The main indications of treatment are to arrest the progress of the disease and prevent its extension to the smaller tubes, to favour secretion and increase fluidity, or, if you like, diminish viscosity of the discharge from the inflamed mucous surface. Various measures may be adopted to effect this. If the child be an infant, and remain a good deal in the nurse's arms, she should sit at the side of the fire. A bronchitis kettle may be kept steaming on the fire. There are other means of equal efficacy in moistening the air, and one of the best is keeping a small screen—a clothes screen answers the purpose well—around the child, and covering it with a wet sheet. Very rapid evaporation takes place, so that the sheet, provided the temperature of the room be kept high enough, requires to be redipped

every hour or hour and a half. A flat sponge bath, with about an inch deep of water in it, may be kept in the centre of the room or near the bed. When the child is in its cot we must modify our plan so as to suit the situation by surrounding the cot with a tent, and there are two methods generally adopted of moistening the air. We may either keep a kettle steaming into the bed, which I think the least efficient of the two, or hang wet towels all round the inside of the cot upon a cord suspended for the purpose. After a trial of this method for many years, I can with confidence recommend it. By this means the air of the cot is kept quite as moist, if not more so, than by means of the steam kettle, which I now seldom use in Hospital except in croup cases, in which, after tracheotomy especially, we can direct the steam close to the tube if necessary. Having placed our patient under favourable hygienic conditions, the question of feeding should next be attended to. The child should be put upon light nourishing food suited to its age, and only such quantity administered as it is able to digest. Suckling children require little change in feeding unless signs of gastro-intestinal catarrh show themselves, when suitable alterations must be made according to circumstances. In spoon babies the diet should consist of light soup, beef, chicken, or veal, tea and milk, whisked white of egg, etc., all farinaceous food should be interdicted, as it is apt to favour the production of indigestion. As a rule solid food should be either withheld, or given in only small quantity at long intervals. Care must be taken in any case not to overload the stomach, but rather to feed frequently in small quantities; this is particularly necessary in gastro-intestinal complications. In such cases the milk should either be alkalized with bicarb. of soda, or lime water, or peptonized. The stools should be regularly examined from day to day, and if unnatural, the food must be altered either as regards quality or quantity. In gastro-intestinal catarrh, besides careful regulation of feeding as to both quantity and quality, we ought to administer, if need be, such remedies as bismuth, or aloes, or rhubarb, combined with alkalies. Occasionally a dose of hydrarg. c. creta or calomel may be indicated. In intestinal catarrh the combination of hydrarg. c. creta with pulv. ipecac. c. opio is useful. One or two grains of dried sulphate of iron, as recommended by Dr Eustace Smith,¹ is often of service, given every four hours in mucilage, in the gastric form of catarrh.

The question of the administration of stimulants in children is important. The condition of the pulse and the general nerve tone of the child in connexion with the extent of the disease or nature of the complication must be our guide. It may be stated generally, that in most severe cases of bronchial catarrh of long continuance, and in catarrhal pneumonia, stimulants are required in greater or lesser quantity sooner or later. Whenever the pulse becomes com-

¹ *Disease in Children.*

pressible or irregular the indication is clear for their administration, and frequently at the same time it may be desirable to give a few drops of tinct. of digitalis. Brandy on the whole is the most useful stimulant, generally preferable to wine. It should be given in small doses, frequently repeated, along with food, and its effects carefully noted. If wine be used, the time-honoured sack whey is as good a form as can be selected.

I should like next to allude to external applications. Acute bronchial catarrh in children is generally relieved by rubefaction of the chest, and local diaphoresis produced by suitable means. By keeping the cutaneous capillary circulation in a state of activity, we have a ready and direct means of relieving the congested condition of the pulmonary circulation. Rubefaction may be produced by the application of sinapisms, care being taken not to continue this too long in case vesication takes place, which is apt in infants to result from their too potent or prolonged application. Mustard is one of the most ready and efficient means at our disposal, and as a rule it is best applied in the forms of the ordinary cataplasma sinapis, of the strength of one part of mustard to four or five of linseed meal, made into a jacket poultice, and kept on till the skin is well reddened, from fifteen or twenty to thirty minutes, until the necessary effect is produced. Rubefaction may be produced also by the application of diluted lint. ammoniæ or lint. terebinthinæ, in which case the liniment should be painted over the entire chest, which is afterwards encircled with cotton-wool. Having produced rubefaction of the cutaneous surface, our endeavour should be to keep up the activity of the skin and avoid any revulsion or chill. The time-honoured poultice of linseed or other emollient substance applied in the form of a jacket is a means of doing this, but I think neither the most convenient nor suitable for the purpose in the majority of cases. My objections to linseed poultices in young children are that they are heavy, dirty, and unctuous, and do not keep up the action of the skin so well as other applications to be hereafter noted. Another objection to poultices is that, except in hospital, or in private practice, when you have the advantage of a skilled nurse, it is difficult to get them properly made and applied. A poultice badly made and improperly applied, and allowed to get cold, is worse than useless. Another objection is, that in young children, who are constantly moving, and require perhaps to lie in the nurse's arms, the poultice is apt to get crumpled up and lumpy. I am quite sure I have seen the most evil results in private practice from the careless application of poultices, and I consider it to be the duty of the practitioner, if he think it desirable to order them, to see that they are properly made and applied. It is not sufficient to write a prescription and order a poultice, but to see the details of treatment carefully carried out in every respect. The practice that I

have now followed out for many years, and which I notice is now in favour with other practitioners in treating the acute bronchial and other chest affections in children, is, after suitable rubefaction of the surface has been produced, and the secretion of the skin excited to activity, to encase the chest in a light cotton wool jacket. This serves the purpose of keeping up a uniform temperature on the surface, and answers admirably. The jacket may be made and applied in three different ways; the cotton wadding, which must be the common sheet wadding used by tailors and dressmakers for padding, may be basted on a fine cotton or linen jacket, or on to a thin macintosh cloth jacket, or this jacket, instead of being applied dry, may be squeezed out of water before application, in which case we have a clean and light poultice, which can be worn continuously. In choosing the method of application I am in the habit of being guided by the condition of the skin. If with the simple jacket it does not act sufficiently, the substitute of the macintosh covering generally produces sufficient diaphoresis for our purpose, if not, the cotton wool may be moistened in the way indicated. In applying the wet cotton wool jacket the wool requires renewal every second day, perhaps oftener. If preferred, soft old linen may be used instead of cotton wool, and then we have an application exactly similar to the ordinary abdominal compress. Whatever measure we adopt to attain the desired end, I hold that it is beneficial in these acute chest cases to stimulate the action of the skin and keep up local diaphoresis. Medicated cotton wool is often of service. Salicylic wool or pinewood oil wool may be used. A very convenient and ready method of medicating the cotton is to sprinkle over the jacket before it is applied a few drops of oil of eucalyptus, pinewood oil, or terebene. Whichever method is adopted, I feel sure that these applications are in the case of children more suitable and convenient in every way than the old emollient poultices. I have not yet had the opportunity of trying cold compresses or ice-bags in the pneumonia of children, but from the success of the practice in certain cases in the hands of others, I should think it to be justified. *Other outward applications* may be of service, especially dry cupping, or the application of one or two leeches in the interscapular region or over the base of one or other lung. Local bleeding is especially useful in some cases of pneumonia where there is evidence of impediment of action and congestion of the right heart. Impending death may be often averted by timely local depletion in such cases.

The administration of drugs in acute bronchial catarrh and its complications demands careful consideration. The routine treatment too often in vogue of giving ipecacuanha or squill cough mixtures, with the indiscriminate application of poultices, cannot be too strongly deprecated. Every case should be treated strictly on its own merits, and with due regard to the constitutional

peculiarities of the child, remembering the principle which we cannot too often recall, that it is not so much the disease that we have to treat, as the disease as it exists in the patient specially under observation at the time. In hospital practice, where one is untrammelled by the necessity of ordering drugs to please the patient or his friends, I very often treat ordinary cases of mild bronchial catarrh without the administration of any medicine except an aperient, or it may be an emetic, trusting solely to hygienic and dietetic management on the lines I have already indicated. In severe cases, however, the benefit derived from carefully selected therapeutic measures is of great value.

The classes of drugs of special service belong to the emetics and expectorants.

Emetic remedies are among the most useful and powerful means at our disposal of promoting the bronchial secretion and emptying the tubes. They must not be used as a routine practice in all cases, but with discriminating care. I have already alluded to the frequency of natural emesis. It is therefore obvious that when this takes place from time to time it will be unnecessary to produce vomiting artificially. The indications for the use of emetics are constant dry cough with deficiency or dryness of the secretion, high fever, with full strong pulse, and deficient action of the skin. An emetic of apomorphia or sulphate of zinc, with or without ipecacuanha, or of ipecacuanha alone, seldom fails to give relief to the symptoms, by promoting the secretion of both bronchial mucous membrane and skin. Care should be taken in the administration of this class of remedies in debilitated children, as they are sometimes apt to produce great depression. It may be said generally that emetics are more suitable in the earlier than the later stages of the disease, in sthenic than in asthenic cases, and that in cases complicated by catarrhal pneumonia their employment is often of doubtful value.

In regard to the use of expectorant remedies, judicious selection is necessary according to the exigencies of the case. All empirical and routine treatment should be avoided. Choice must be made with due regard not only to extent of the disease and the exact pathological conditions, but with reference to the constitutional peculiarity of the child, and the state of the circulation and the bronchial secretions. In a strong child, during the earlier stages of severe bronchial catarrh great relief is obtained from the use of the sedative circulatory expectorants, such as antimony, apomorphia, or ipecacuanha, with or without alkalies. The effect of these remedies is often most beneficial, but their action must be closely watched, and their administration stopped towards the height of the disease, or when any symptoms of depression of the circulation, or otherwise, become manifest. Children do not bear the administration of this class of remedies as well as adults, or, at all events, do not stand a long continuance of their administration

so well. After the height of the disease, or in cases where there is a tendency to debility or feebleness of circulation, ammonia in the form of aromatic spirits or subcarbonate, or small doses of the hydrochlorate combined with senegæ, or with minute doses of that most valuable of all stimulants of the respiratory centre and nerve respiratory apparatus, strychnia, will be found of great service. Perhaps the most useful of all the expectorants in children are the saline, the alkaline carbonates, or the citrate of potash, combined with minute doses of the sodium or ammonium iodide. The effect of these drugs in promoting expectoration by increasing the fluidity of the secretions is of great service. They may be given early in the disease and continued to its height, thereafter being combined with senega or tinct. of nux vomica. There is another class of remedies which I cannot conclude without alluding to,—I refer to the terebinthinate ones, such as eucalyptus, turpentine, terebene, and such like. As a class they are more useful in the more chronic forms of the disease, with the exception of terebene and eucalyptus,—the latter used as an inhalation, the former internally. They seem to be antiseptic and antispasmodic; especially do I consider the latter action to be associated with terebene. It seems specially useful in cases where there is deficient secretion associated with bronchial muscular spasm. Two or three drops given along with the child's food often gives great relief to the cough, and otherwise allays irritation.

In acute catarrhal pneumonia the use of emetics requires great caution, and is often contraindicated by the feeble condition of the child. If I am asked what are the special lines of treatment in this complication, in addition to those laid down for ordinary severe bronchitis, I should say the main indications are,—to support the patient's strength by suitable diet, and stimulants if need be, and they are generally required, so as to give the child stamina to cope with this disease, the duration of which is usually indefinite and a sore tax on the vital power. Avoid the use of continuous moist poultices as a rule, preferring intermittent rubefaction or blisters of small size. As to drugs, antipyretics are often needed. The class of ordinary expectorants is usually contraindicated, except those of a stimulating nature. Most reliance must be placed on tonic doses of quinine or nux vomica, after the first week or ten days.

The limits of this paper forbid my going more fully into the medicinal treatment of bronchial catarrh in children, but I trust I may have said enough to show that the administration and choice of drugs in treating these ailments in early life require even more care and discrimination than in the same diseases at a later period of life.

