EMERGENCIES IN GENERAL PRACTICE

TREATMENT OF ACUTE PNEUMONIA

BY

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The general practitioner nowadays rarely encounters the old-fashioned clinical picture of "typical lobar pneumonia." The patient is usually seen because he has developed an acute and more or less serious respiratory infection. It may occur in the healthy, following a cold with pyrexia—often loosely labelled "influenzal"; or it may be an acute exacerbation in a patient who is known to have chronic bronchitis. Inhalation or spread of pathogenic organisms into the lungs is always a risk when there is upper respiratory infection; hence the wisdom of encouraging the individual with a coryza to stay indoors, and those with accompanying pyrexia to stay in bed. Aspiration of mucus from acutely infected nasal sinuses, or the formation of sticky secretions as a result of infection in the bronchi themselves, may block bronchi or bronchioles and lead to corresponding areas of "aspiration pneumonia." Even in an epidemic of true influenza it is the secondary invaders which are the usual cause of "influenzal pneumonia"; the virus breaks down the normal respiratory defences by damaging the mucous membrane of the trachea and bronchi, and the lungs are open to invasion. Pure virus pneumonias, whether from influenza, ornithosis, or other viruses, are relatively uncommon.

There is good evidence that the pneumococcus is still easily the principal cause of acute pneumonia. While it is true that the isolation of pathogenic organisms is by no means always successful, and while the incidence of various organisms may vary according to the prevalent epidemic or to the selection of cases, nevertheless large-scale studies—for example, in London in 1942–4¹ and in various parts of the country in a Medical Research Council trial in 1950–1²—showed an overwhelmingly high incidence of pneumococcal infection. From the practical point of view, and taking patients treated at home as well as at hospital, it is reasonable to assume that something of the order of 90% of the cases of acute clinical pneumonia are due to pneumococcal infection. This assumption is of the utmost importance in the early assessment, as it is impossible to wait for a precise bacteriological diagnosis before beginning treatment. From this aspect, the family practitioner is in just as good—or bad—a position as the hospital doctor, and both must act on the basis of probability. They will naturally make allowance, so far as they can, for any known variation in the type of epidemic, or for any special information which they may obtain from contemporary cases.

General Management

Every practitioner called upon to treat a patient suffering from acute pneumonia will appreciate the primary need for warmth, rest, adequate fluids, and light nourishment, and the relief of cough, pain, and insomnia. It is a good aim to make the patient as comfortable as possible. Dryness of

the tongue is an excellent and simple measure of the need for fluids; an adult may need at least four or five pints (about 2.5 litres) a day to keep his tongue moist. Many patients prefer ordinary cane sugar to glucose as a sweetener. Pleuritic pain may be relieved by a kaolin poultice, which is most comfortably held in position by a many-tailed bandage. An irritating, unproductive cough is tiresome and exhausting, and may be painful; a codeine linctus containing $\frac{1}{2}$ to 1 gr. (32–65 mg.) of codeine phosphate is usually sufficient to quieten it down. Occasionally the cough is so severe and racking as to wear the patient out with pleural pain and lack of sleep; as this usually occurs in the early stages of the illness, before secretions accumulate in the bronchi, it is probably safe to give an injection of morphine ($\frac{1}{4}$ to $\frac{1}{2}$ gr.—11 to 16 mg.) to take the edge off these troubles. Rarely the cough is too troublesome to be controlled by the above remedies, and then a linctus containing 1/18 gr. (3.6 mg.) of heroin to the dose may be successful. There is no point in repeating the dose of this drug more than twice, at four-hourly intervals; its use here is to tide the patient over a critical period.

Where particular care is needed on account of chronic respiratory or cardiovascular disease, or where home conditions are unsuitable, hospital facilities will usually be required. The decision to move the patient will depend on many factors; if possible, it should be made early rather than late in the course of the disease.

Severity of the Illness

In the patient with chronic bronchitis, the illness is often more insidious than the dramatic and alarming attack seen in the previously healthy patient with a highly vascular lung. In the child, the alcoholic, and the aged the disease is usually more disturbing than in the normal adult subject. The character of the lung and the presence of cardio-respiratory changes modify the clinical picture and thereby the urgency of treatment. The chronic bronchitic rarely shows a septicaemia or even severe toxæmia, but readily develops heart failure; the adolescent, with no fibrotic barrier, may be overwhelmed with toxæmia. Conversely, drug levels which are effective in the young may be insufficient to produce an adequate drug concentration in the inflammatory lesions of the patient with chronic bronchitis.

The degree of illness of the patient is a product of the virulence of the invading organism on the one hand and of susceptibility to general toxæmia and local disturbance of the lung on the part of the patient on the other. Most infections are of mild or moderate virulence, though even a mild infection may be sufficient to cause death in advanced cardiac disease. The number of individuals who, in the early stages, have to be regarded as desperately ill is small; thus only 19 patients in a total of 267 admissions in the M.R.C. trial of 1950–1 were regarded as desperately ill on arrival at hospital. This group will require immediate antibiotic treatment, even before the transfer to hospital which is usually advisable. If facilities are reasonable, the illness of average severity can be treated at home; the room temperature and amenities may be more suitable than in hospital.

Early diagnosis, often on the basis of brisk fever and malaise with minimal but suggestive signs in the chest—in

¹ Humphrey, J. H., Joules, H., and van der Walt, E. D., *Thorax*, 1948, 3, 112.

² *British Medical Journal*, 1951, 2, 1361.

particular, fine crepitations—is the key to successful management; it is the rule rather than the exception for pathological change in the lung to be arrested by adequate treatment before frank lobar consolidation occurs. The mild illness is often undiagnosed and the patient makes a satisfactory recovery without treatment; the lesion is commonly a segmental aspiration pneumonia, due to bronchial obstruction by secretions produced by a coryzal infection, and the virulence of the organisms concerned is low. If the diagnosis is made, immediate treatment by physical methods is more important than antibiotic measures; neglect of these measures may result in bronchiectasis.

Specific Treatment of Pneumococcal Infection

Penicillin, by general experience, remains a very satisfactory antibiotic in the treatment of pneumococcal pneumonia. Special investigation confirms its effectiveness, and shows that it is at least the equal of any other antibiotic, and superior to most (M.R.C. trial, 1951). Sulphonamides are almost as effective as penicillin, except under certain conditions, in particular where pus has formed.

A scheme of treatment by sulphonamides or penicillin is shown in Table I. An infection of moderate severity in

TABLE I.—Scheme of Treatment of Pneumococcal Pneumonia

Infection of average or moderate severity, in a previously healthy person with a good blood supply to the lung	Sulphadimidine or sulphadiazine: 2 g. initially, then 1 g. 4-hourly for 24 hours and 1 g. 6-hourly for 4 days
Severe infection in same type of patient (instead of or in addition to the above sulphonamide)	Penicillin soluble (or penethamate): 300,000 to 500,000 units 8-hourly for 24 hours, then 500,000 units 12-hourly for 48 hours, followed by procaine penicillin 600,000 units daily for 2 to 4 days
Infection of moderate severity in a person subject to chronic bronchitis, or congestion of cardiac origin	Penicillin course as above (sulphonamides not recommended)
Suspected lung abscess, fulminating toxæmia, and severe infections in chronic bronchitis	Penicillin, soluble, 1,000,000 units 4-hourly, until improvement or change of therapy

The doses are for the adult of average body weight.

the patient with a highly vascular lung responds well to either of these drugs. The scarred and fibrous lung of chronic respiratory disease will require a higher blood concentration to achieve comparable local tissue concentration, and a higher dosage is advisable. Treatment should be continued for a minimum of five days; with penicillin treatment seven to ten days will sometimes be necessary, especially in the chronic sufferer. Oral preparations of penicillin are erratic in absorption and are therefore not recommended. Treatment in adults should always be parenteral; in small children the oral route may be permissible on occasion, but the dosage must be high (1,000,000 units, plus 500,000 units per 14 lb. (6.35 kg.) body weight per day, in divided doses of 200,000 or 400,000 units, according to age).

The treatment outlined makes the assumption of a pneumococcal infection sensitive to penicillin. As there is something like a one-in-ten chance of error in this view, and as some of the exceptions will develop a severe illness, close assessment of progress is essential. In the majority of patients there is a marked improvement in 24 to 48 hours, with a fall in temperature and lessening of toxæmia. Sometimes there is general improvement even though the temperature remains high or the physical signs progress. A failure to improve calls for patience, though the intensity of penicillin treatment should be increased if progress is regarded as unsatisfactory. Unless there is unequivocal evidence of deterioration, rather than a failure to improve, the temptation to change to another antibiotic should be resisted for

a second 24 to 48 hours, during which time bacteriological information should provide, in many instances, a guide to treatment.

Causes of Unsatisfactory Progress

The principal infective causes of deterioration and serious illness are as follows.

(a) *Pus Formation in the Lung or Pleural or Pericardial Cavity.*—Readily accessible collections of pus must be drained; repeated aspiration may be sufficient, but a drainage tube or open drainage will be necessary on occasion. Most lung abscesses, with the exception of those associated with bronchial obstruction, will resolve gradually if the dosage of penicillin is large enough to produce an effective concentration of the drug inside the cavity. This can usually be produced by a dosage of 8 million units a day parenterally, injections being given not less frequently than six-hourly; two to four weeks of treatment may be necessary.

(b) *Septicaemia, Endocarditis, and Pyæmic Complications.*—These complications suggest that the disease was well advanced before any treatment was started, that the dosage of antibiotic was too low, or that a pneumococcus is not the cause of the illness. High dosage of penicillin will be required and drainage of pus may be necessary. An organism will probably grow in culture of the pus and allow a more precise selection of antibiotic.

(c) *Infection with an Organism Resistant to Penicillin.*—There are several possibilities in this group. Some are exceptionally rare, as, for example, plague, anthrax, and enteric fever. Others are less uncommon and need early consideration. (1) *Certain penicillinase-producing staphylococci:*—Infection of this type has become more common in recent years. It is more apt to occur in a community much exposed to penicillin treatment, as in hospital wards, than in the general population. Septic foci in throat, skin, or nose will raise suspicions of the possibility of staphylococcal infection and the risk of penicillin resistance must then be recognized. Bacteriological study by culture and exposure to penicillin will confirm the diagnosis. The illness can be fulminating, especially in influenzal epidemics, and the prognosis is always grave. (2) *Tuberculosis:*—Bacteriological and radiological investigations will be required for diagnosis. (3) *Friedländer's bacillus:*—This organism is occasionally highly virulent and can cause a rapid and destructive "pneumonitis." The organism in an apparently non-virulent form is quite common in the sputum, particularly in chronic respiratory disease; it is a Gram-negative encapsulated coccus-bacillus. If direct examination of the sputum early in the course of the disease shows a heavy infection with this organism, it must be regarded as the pathogen; a similar finding after antibiotic treatment is of much less significance. The condition is rare; clinically, the sputum tends to be brick red, sometimes persistently, and radiologically there may be marked destructive changes. (4) *Mixed infection in aspiration pneumonias, especially associated with bronchial obstruction such as by growth, gland, or foreign body:*—Abscess formation is common when the bronchus remains blocked; coliform organisms may be present. (5) *Virus or rickettsial infection:*—Psittacosis is usually sensitive to large doses of penicillin, and most of the other virus or rickettsial infections are of slight or only moderate severity, insufficiently disturbing in themselves to cause serious alarm. The more severe pneumonias of influenzal epidemics are associated with secondary infection, pneumococcal, streptococcal, staphylococcal, or from *H. influenzae*, and it is these, rather than the primary infection, which require treatment in pneumonia.

Changing the Antibiotic

Accurate diagnosis in these more difficult cases will depend on culture, sensitivity testing, and special tests such as those for virus antibody formation. Logic and inspiration will have to guide the practitioner if no such bacteriological help is available. Once it is clear that treatment by

TABLE II.—*Additional Antibiotics*

	Chloramphenicol	Oxytetracycline, Chlortetracycline, Tetracycline	Streptomycin*	Erythromycin
Average course	0.5 g. 6-hourly for 24 hours, then 0.25 g. 6-hourly for 4 days 1 to 2 g.	0.25 g. 6-hourly for 5 days	1 g. 8- or 12-hourly for 24 hours, then 0.5 to 1 g. 12-hourly for 4 days	0.3 g. 6-hourly for 5 days
"Loading dose," if required in a severe case		1 g.	—	0.6 g.
Indications	Organism of known sensitivity, e.g., <i>Bact. coli</i> , <i>H. influenzae</i> , psittacosis virus	Organism of known sensitivity, e.g., certain staphylococci (aureus group)	Organism of known sensitivity, e.g., Friedländer's bacillus	Organism of known sensitivity, e.g., penicillin-resistant staphylococci
Dangers	Agranulocytosis, aplastic anaemia, if course prolonged or repeated too frequently	Nausea, vomiting, and diarrhoea. Staphylococcal superinfection with resistant organisms	Vertigo and deafness, vomiting and diarrhoea, skin reactions, staphylococcal superinfection	Vomiting and diarrhoea
Other sensitivity reactions and drug resistance are apt to develop if treatment is repeated or prolonged				

The doses are for the adult of average body weight.

* Streptomycin course for tuberculosis is 1 g. daily for six weeks, with *p*-aminosalicylic acid or isoniazid. This is an "average" course, which may be modified according to circumstances.

other means is necessary, he has a wide choice; he may be embarrassed by this variety and confused by rival claims. There is no substitute for experience when there are several drugs of practically equal potency and, at the same time, toxic potentialities. Table II is an expression of some of the properties of the more useful of the newer and wider-range antibiotics.

A change from penicillin to another antibiotic must be a carefully weighed step; the possibility of a toxic effect with other antibiotics is greater than with penicillin, and such effects are more serious in type and sometimes lethal in themselves. The most dreaded of all is staphylococcal superinfection of the bowel. After one change, a second is indicated only by: (a) allergic or other sensitivity effects, (b) superinfection, or (c) reliable bacteriological findings regarding the type and sensitivity of the organism. A rapid succession of blind jumps from one antibiotic to another rarely eliminates the infection, tends to promote resistant strains, endangers the patient through toxic or sensitivity effects, and indicates panic in relatives and/or doctor. Particular attention must be paid to the general well-being of the patient; where this is maintained, if antibiotics fail to control the temperature or to influence the lung condition dramatically they should not be continued indefinitely. Improvement may continue, or even begin, when the drug is stopped.

Penicillin can be given with sulphonamides or streptomycin. Varied claims are made for enhanced effect in such combinations; some authorities advise higher doses than normal if combinations are used. In acute pneumonia the occasions on which a combination provides the answer to a problem are certainly few. The increased danger of sensitivity or toxic effect will, in general, indicate the use of one drug at a time. A notable exception is tuberculous pneumonia, when streptomycin must always be combined with *p*-aminosalicylic acid or isoniazid to prevent the development of resistant strains of tubercle bacilli.

Chloramphenicol, oxytetracycline, and chlortetracycline (bacteriostatic) should not be used at the same time as penicillin or streptomycin (bactericidal). They tend to inhibit the action of penicillin rather than to enhance it.

Physical Measures

The spectacular effect of chemotherapy has drawn attention away from the mechanical blockage which is present in many cases of pneumonia; there is a tendency to leave everything to the drug. Yet in even mild infection the bronchus may become bronchiectatic unless steps are taken to clear it by postural drainage and percussion; the risk is high in childhood and debilitated patients. If this physical method is used early, antibiotic treatment can be avoided in many cases of the catarrhal aspiration pneumonias. A steam-tent or inhalations and assisted coughing, in which the affected part of the chest is pressed by the attendant as the patient coughs, are most helpful in clearing the bronchus, and do not exhaust the patient. In very ill patients more vigorous measures will not be possible until there has been some improvement, but they must be intro-

duced as soon as they can be tolerated without real distress. In the absence of a trained physiotherapist or nurse it is often possible to train a parent or relative in the method; the doctor's own visit will be more usefully spent in this way than in unduly frequent examinations. A large clothes-horse can be arranged to support a sheet over the upper half of the bed and will make an adequate steam-tent. A little determination and ingenuity will find a way to procure steam; electric kettles, open basins of hot water, and a length of wide rubber-tubing or a stomach-pump tube from a kettle spout on the hob are some alternatives to the expensive steam-kettle.

Conclusion

It is clear that where progress is unsatisfactory the wisest course may be to send the patient into hospital. Without skilled help, for example, the efficient administration of oxygen may be impossible. Moreover, the hospital has usually the best facilities for chest radiographs and for the collection and examination of material for bacteriological studies. If, however, the patient stays at home, there may be every clinical justification for a consultation with the bacteriologist, and for a domiciliary chest radiograph. Patients needing such help form a very tiny minority. Happily, most patients with pneumonia get better quickly. When they do get better, however, it is wise to confirm the clinical recovery by a radiograph of the chest.

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Both these volumes are obtainable from the Publishing Manager, B.M.A. House, Tavistock Square, London, W.C.1, or through any bookseller.

The Hong Kong Government has approved plans for a new hospital with 1,275 beds to be built in Kowloon at a cost of about £3,125,000. Provision is made for a special children's section containing 200 beds. When completed in 1960 the hospital will be the biggest of its kind in the Commonwealth. The thirteen-story building, occupying the site of the Navy Recreation Ground and Salvation Army Camp at King's Park, will have a complete range of the most modern facilities, including deep x-ray plants, isotope laboratories and treatment rooms, and physiotherapy rooms. The hospital has been designed by a British firm of chartered architects, Messrs. Easton and Robertson, of London, and the whole project, including quarters for medical and nursing staff, will take three years to complete.