

INTENSIVE RESPIRATORY CARE

A survey of 350 consecutive cases

By

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A unit for the intensive management of cases of potential, imminent or actual respiratory failure has existed in the Royal Victoria Hospital since 1962 but for three years prior to this, members of the Department of Anaesthetics were treating such cases in the general wards of the hospital or giving advice on their management elsewhere if requested. The present consultant in charge of the unit held a hospital research fellowship for two years. The object was to investigate the need for such specialised work in Northern Ireland and suggest how it could be best carried out.

Over the seven year period 1959–1966 about 400 patients have been cared for in, or by members of, the unit and this brief report deals with the nature of 350 consecutive cases, with some data on the method and outcome of treatment. Some aspects of this have been published by Dundee and Gray (1963) and by Gray and Dundee (1965). This is not an exhaustive survey but it is hoped that it will give some indication of the type of patient most likely to benefit from intensive respiratory care.

STAFFING

In contrast to some other centres, the main care of these patients is in the hands of the anaesthetists, but when they are transferred from other units the advice and help of the staff concerned is valued, particularly in relation to special problems. The unit has full time Consultant Anaesthetist cover on a sessional basis, Dr. R. C. Gray contributing six sessions and Professor J. W. Dundee and Dr. R. S. J. Clarke, two sessions each. The senior anaesthetic tutor provides holiday cover and night and week-end cover is shared by all four. There is an anaesthetist in training allocated to the unit on a rota basis; these are of seniority ranging from senior house officers to senior registrars, depending on their needs. The period is normally for one month and a night rota is provided by all the trainees. This means that there is always an anaesthetist in the unit (which has its own bed-sitting room) when a patient is on a respirator and at such other times as necessary.

The permanent nursing staff consists of one sister and three staff nurses, continuity being provided by the staff nurses taking turns on night as well as day duty. The junior nursing cover is on the basis of one nurse per patient at all times so that the total number of nurses required varies widely but can be as many as 19 with six patients in the unit. Physiotherapy is also necessary seven days a week and at least once during the evening and night as well as the standard day-time visits.

CLASSIFICATION OF CASES

As implied from the opening remarks, the work of the unit is not limited to the management of cases of established respiratory failure. In fact, if at all possible, many patients are seen and admitted before the respiratory insufficiency develops. In some instances, respiratory failure can be averted by appropriate treatment such as tracheo-bronchial toilet, humidification, antibiotics or barrier nursing, with or without tracheotomy. Early admission is desirable for patients with potential respiratory failure, especially in convulsive states, myasthenia gravis and severe chest trauma. Here constant nursing care and individual attention can reduce the risk of a sudden hypoxic episode. It also allows a close watch to be kept on the progress of the disease and institution of appropriate measures at the earliest possible moment.

Many pathological and aetiological classifications of the causes of actual respiratory inadequacy have been described, and taking the broader interpretation of the meaning of respiratory failure, the clinical classification of Dundee and Gray (1963)

TABLE I

Classification of causes of respiratory insufficiency

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A : <i>Central depression</i>	poisoning. increased intracranial pressure. head injury. cerebrovascular accident. miscellaneous—post-hypoxia hypoglycaemia.
B : <i>Impairment of respiratory mechanism</i>	
Nervous tissue	poliomyelitis, polyneuritis, porphyria.
Myoneural junction	myasthenia gravis, carcinomatous neuropathy.
Muscle	polymyositis, progressive muscular atrophy, trauma to chest wall.
Obstruction to airway—	including asthma.
Lung damage	bronchitis and emphysema. pneumonia, including effects of aspiration of stomach contents.
Pain	traumatic or post-operative.
C : <i>Mixed causes</i>	cardiovascular and respiratory inadequacy.
D : <i>Induced insufficiency</i>	
Inadvertent – following muscle relaxants.	
Therapeutic – control of convulsions.	

seems to be comprehensive (Table I). The frequency of the various causes will now be discussed, with the incidence of each requiring intermittent pressure ventilation (I.P.V.).

CENTRAL DEPRESSION

Total 136 (39%)

	<i>No. of cases</i>	<i>% I.P.V.</i>
Poisoning	57	44
Head injury	24	60
Cerebral tumour	7	57
Cerebrovascular accident	12	92
Encephalitis	7	71
Emboli (mostly fat)	11	9
Post hypoxic episodes	12	75
Hypoglycaemia	3	67
Cerebral abscess	3	100

Although barbiturates are still the main drugs used in suicidal poisoning, in many cases they were combined with other preparations such as meprobamate, phenothiazines or other tranquillisers. This contrasts with some other large reported series (Matthew, 1966) but it must be remembered that the 57 patients discussed here form only a small percentage of poisoned cases admitted to the Royal Victoria Hospital during the years under survey. There was only one fatality in 30 cases of barbiturate poisoning, whereas both cases with carbon monoxide poisoning died, probably because they had suffered irreversible cerebral damage before admission. One interesting pharmacological puzzle was the patient who survived following what were expected to be fatal doses of meprobamate and strychnine and aspirin – presumably these drugs antagonised each other to some extent.

The outcome has been disappointing in cases with head injury (50 per cent. mortality), apnoea following cerebrovascular accidents (92 per cent. mortality) and in those suffering from a post-hypoxic episode (75 per cent. mortality). There have been no survivors following severe head injuries causing apnoea, despite prolonged periods of I.P.V.

For those who may be faced with the problem, it is worth noting that none of the three patients with severe hypoglycaemia survived. These, and carbon monoxide poisoning, could be also classed as post-hypoxic with the twelve cases who had periods of cardiac arrest, giving an overall mortality of 80 per cent.

IMPAIRMENT OF RESPIRATORY MECHANISMS

Total 133 (38%)

	<i>No. of cases</i>	<i>% I.P.V.</i>
Poliomyelitis	3	67
Polyneuritis	18	67
Porphyria	18	67
Polymyositis	7	87
Myasthenia gravis	7	87
Carcinomatous neuropathy	4	50
Progressive muscular atrophy	1	100
Trauma to chest wall	25	76
Airway obstruction	8	25
Respiratory infection	27	56
Aspiration pneumonitis	6	50
Post-pneumonectomy	13	85
Other post-operative	15	33
Lung tumour	2	50

Paralytic poliomyelitis has not been the cause of as many cases of respiratory inadequacy as polyneuritis, which appears to be increasing both in frequency and severity. Ten of the eighteen patients died, mostly of extensive involvement of the gut, autonomic nervous system or even the heart, while the period of treatment of survivors was usually very long (3-10 weeks).

Acute intermittent porphyria was probably barbiturate-induced in both instances. Myasthenia gravis crisis and cholinergic crisis are benefited by periods of artificial ventilation and carry a good short term prognosis with no deaths in the seven patients, although at a later date one died from intra-thoracic spread of a malignant thymoma.

Chest injuries were the third most common condition necessitating the services of the unit. They were rarely the sole pathology in the patients who often had head, abdominal or other injuries. Campbell (1966) found multiple injuries in 63 per cent. of a large series. These carried a 50 per cent. mortality, with cardiac trauma and lung haematoma being common in the fatalities. Early experience with I.P.V. in chronic bronchitis or cor pulmonale was not encouraging, for though patients could be tided over an acute exacerbation, they often quickly relapsed into respiratory failure, particularly in the winter. One could not help being troubled by the ethics of management of one such patient who was respirator-dependent for over a year.

MIXED CAUSES		Total 21 (6%)	
		<i>No. of cases</i>	<i>% I.P.V.</i>
Pulmonary oedema	.....	4	75
Peritonitis/shock	.....	2	100
Bulbar paralysis	.....	1	100
Arnold-Chiari syndrome	.....	1	100
Post cardiac surgery	.....	13	69

In many of these patients, assistance of the unit staff was not sought until the condition of the patients was critical. Nevertheless, tracheobronchial toilet, humidification and adequate oxygenation, with or without artificial ventilation often resulted in a startling improvement in their condition.

INDUCED RESPIRATORY INSUFFICIENCY		Total 60 (17%)	
		<i>No. of cases</i>	<i>% I.P.V.</i>
Inadvertent—post relaxant	.....	6	83
Therapeutic—Tetanus	.....	48	71
—Epilepsy	.....	6	83

Surprising as it may seem, tetanus was the most common cause of admission to the unit during the past three years. The respiratory problems in this disease are many, including inability to swallow leading to aspiration of secretions, bruising of the tongue, spasm of the glottis and respiratory muscles, coupled with an increased demand for oxygen during convulsions. While these can be managed in some mild cases by posture, sedatives, anti-spasmodics and analgesics, tracheotomy with or without curarisation and I.P.V. often provides the only hope for survival. Tetanus requires the most meticulous and prolonged care of all conditions (Ablett, 1956). Nutrition, electrolyte and acid-base balance, bowel function, relaxant and sedative

dosage and infection of the respiratory tract all pose special problems. The successful outcome demands co-operation between nursing staff, medical staff and physiotherapists and it has been estimated that, on an average, treatment of a typically severe case in this series cost about £1,000. Twenty-eight survivors (80 per cent.) out of 35 severe cases who required curarisation (Gray and Dundee, 1966) compares favourably with larger series where circumstances necessitated limiting the length of the period of curarisation and I.P.V. (Adams et al 1966). In general, the worst results have been obtained when patients over the age of 65 required curarisation. The same principle of converting spontaneous inco-ordinated ineffective respiration into effective artificial ventilation has been successfully applied to some cases of status epilepticus, with good results. Our limited experience does not support the views of Brown and Horton (1967) that these cases can always be safely controlled with thiopentone. One patient continued to convulse after 4 g. of the barbiturate, although showing signs of severe barbiturate poisoning, while another had vomited and aspirated when thiopentone was given in the ward.

CHANGING PATTERN OF CASES

The frequency of some of the most common conditions requiring treatment by the unit for the 1959-1963 (200 patients) and 1963-1966 (150 patients) periods are compared in Table II. Attention has already been drawn to some of the important differences with reference to the incidence of poliomyelitis, polyneuritis, bronchitis, trauma to chest wall and tetanus. If the present trend continued unabated the incidence of the latter two conditions may soon outstrip the present facilities of the unit.

TABLE II

	% Incidence of cases		% Requiring I.P.V.	
	1959-1963	1963-1966	1959-1963	1963-1966
Poisoning	17	15	26	70
Head Injury	9	4	43	100
Cerebro-Vascular Accident	44	3	87	100
Poliomyelitis	2	0	67	
Polyneuritis	3	9	40	86
Polyneuritis	3	9	40	86
Bronchitis/Cor Pulmonale	9	4	39	83
Chest Wall Trauma	3	13	50	85
Myasthenia Gravis	2	3	67	100
Post-operative				
Lung Surgery	3	5	80	88
Cardiac Surgery	3	5	20	100
Embolic phenomena	3	2	0	30
Others	2	7	0	50
Tetanus	11	17	68	73

Incidence of cases of various types of respiratory failure and per cent. requiring intermittent pressure ventilation.

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