produce a circumferential indentation of the globe (Fig 10). Plombage and encircling may be used in combination (Fig 11). Internal tamponade consists of increasing the contents of the vitreous cavity in an eye whose internal pressure has been reduced by the deliberate release of subretinal fluid through a scleral puncture (Fig 12). Air, saline, donor vitreous, a plasma substitute, or more rarely liquid silicone may be used for this purpose.

Postoperative Management

The postoperative treatment is often individual to the surgeon in charge of the patient, but as a general principle either double-padding or occluding glasses are used for a limited period, after which stenopaic slits and later dark glasses are worn. When the patient gets up depends to some extent on the site of the retinal tear, and when this is the lower half of the retina the patient is allowed up after 24 hours. In detachments of the upper half a longer period of rest in bed is generally advisable.

A return to normal activities depends on the patient's occupation, sedentary employment being much more accept-

able than heavy physical exertion. In the absence of other contraindications, a successfully treated patient should be able to resume his normal occupation and reasonable sporting activities within three months.

Prognosis

The prophylactic treatment of retinal detachment carries a high success rate. The results quoted vary when considering cases undertaken for curative treatment, but the proportion of successes is over 70%. Special centres which attract difficult and previously unsuccessfully treated cases still maintain a similar rate of success. The recovery of a satisfactory standard of visual acuity depends on several factors, including the duration of the detachment, the presence or absence of macular involvement, and the extent of the surgical treatment necessary to reposition the retina successfully.

Finally, it is important to reiterate the statement already made—that retinal detachment and the presence of predisposing retinal lesions constitute a bilateral problem in an appreciable proportion of cases.

Hospital Topics

A Review of Experience Operating a General Medical Intensive Care Unit

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British Medical Journal, 1971, 1, 158-161

Summary

From 18 months' experience of operating a four-bedded general medical intensive care unit a high staff-to-patient ratio was the most important factor in its success. Heavy capital spending does not appreciably reduce the importance of adequate numbers of trained staff, though patient-monitoring equipment can be useful and sometimes vital. As the scope for intensive care widens, the problems of clinical care become difficult, because no doctor is likely to be competent enough to provide for all categories of patients, and there is no intensive care equivalent of the general physician. Intensive care is likely to function best in a divisional specialist system of clinical care.

Introduction

In the past 10 years the practice of nursing acutely ill patients in specialized intensive care units has increased. This stems from the success such units have had in reducing mortality,

particularly after cardiac surgery and acute myocardial infarction. As a result many hospitals have provided, or are planning, such units. The rationale and, presumably, the success of intensive care units are based on their ability to concentrate nursing and medical expertise in one area, providing a high staff-to-patient ratio and allowing early detection of changes in a patient's condition and the provision of intensive nursing care.

Continuous monitoring of the electrocardiogram after acute myocardial infarction has shown that dysrhythmias may occur in about 85% of patients (Julian, Valentine, and Miller, 1964; Fluck *et al.*, 1967). Antiarrhythmic drugs, direct current cardioversion (Lown, Amarasingham, and Neuman, 1962), transvenous catheter pacemaking (Portal, Davies, Leatham, and Siddons, 1962), and external cardiac massage (Kouwenhoven, Jude, and Knickerbocker, 1960), have made the successful treatment of dysrhythmias possible, and recent authors have laid particular emphasis on early treatment of dysrhythmias (Killip and Kimball, 1967; Lown, Fakhro, Hood, and Thorn, 1967), and the coronary care unit as described by Day (1963) and by Brown, MacMillan, Forbath, Mel'Grano, and Scott (1963) has been developed. By contrast Hubner, Goldberg, and Lawson (1969) have shown that monitoring facilities in general wards without other features of an intensive care unit may not reduce the mortality after acute myocardial infarction. This paper draws attention to the advantages provided by a high staff-to-patient ratio and to the fact that the staff can be adequately trained to become expert.

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The design and organization of intensive care units and the types of patients admitted to them have been debated (Crockett and Barr, 1965; Working Party of B.M.A., 1967). Some authors advocate provision of separate surgical and medical intensive care units to minimize risks of cross-infection. Others (Pentecost, 1968) have recommended that patients with an acute myocardial infarction should be nursed in special coronary care units because these patients may be adversely affected by the hectic activity associated with others who are seriously ill. Matthew and Lawson (1970) have advocated separate units for management of cases admitted with acute poisoning, and other authors have recommended that specialist units should be provided for acute respiratory and renal problems. The reasons provided are sound, but architectural, financial, and staff considerations usually preclude a multiplicity of units, and there is great pressure to centralize activities of specialist units for economy. We have attempted to reconcile these conflicting interests in a general medical intensive care unit.

The Unit

Guy's Hospital is an undergraduate teaching hospital serving a population of about 250,000 and accepts patients referred from other hospitals. There are 355 surgical and 300 medical beds, with separate surgical, paediatric, and medical intensive care units. It is on our experience of the latter unit (Starling ward) that we base this report.

The ward contains five beds, one of which is in a separate cubicle for barrier nursing. Only four beds are regularly used. The nursing staff operate a triple shift system, and comprise two sisters, eight staff nurses, and four student nurses. This provides for three trained nurses and one student nurse for each shift. Drafting additional nurses to the unit for holidays and sick leave is of limited value unless required only for general nursing care. When the unit is not busy the nursing staff are able to relieve on other wards. A trained physiotherapist and one pupil are also attached to the unit.

Each bed has detachable head-and-foot boards, and the head and foot of the bed can be raised or lowered through 20°. Piped oxygen and suction and six 13-amp. electric sockets are provided at the head of each bed. Two beds are fitted with T.E.M. series II Monitron apparatus* for continuous monitoring of temperature, blood pressure, pulse rate, and electrocardiogram. There are simple monitor E.C.G. oscilloscopes at each bedside, and they are linked to a strip chart E.C.G. recorder as well as to a large-screen multiple-channel oscilloscope visible from the central nursing station, enabling simultaneous inspection of all four electrocardiograms. All the patients are visible from the central nursing station.

Patients are admitted under the care of five general medical firms which rotate for emergency duties, and a morning ward round is held daily under the supervision of a consultant physician who has administrative responsibility for the ward. This is a discussion and teaching round, but all decisions on the management and treatment of individual patients ultimately remain the responsibility of the consultant under whom they are admitted. Patients enter by referral from general practitioners, from the casualty department, or by internal transfer, and patients of any age are eligible for admission; individual decisions about the type or age of patients admitted are left to the admitting firm. The services and advice of specialist departments for anaesthetic, respiratory, cardiac, renal, and acute poisoning problems are readily available on request from the general firm caring for the individual patient.

*The series II Monitron apparatus was designed by the M.R.C. in conjunction with the T.E.M. Engineering Company. It measures pulse and respiratory rates, blood pressure, and temperature, and prints out the results automatically.

Results

In the first 18 months 593 patients were admitted to the ward with a mean bed occupancy of 74%, and the mean duration of stay was 2.8 days. Most—526 (89%)—patients were admitted from the casualty department, 56 (9.5%) were moved to the unit from other wards, and 11 (1.5%) were transferred from other hospitals.

The most common diagnosis was acute myocardial infarction (Table I). Thus patients with suspected acute myocardial infarction and other cardiovascular diseases (Table II) accounted for 60.8% of all admissions to the ward. If the few patients admitted with complications arising from artificial pacemakers and cardiac catheterization are excluded as

TABLE I—Admissions to a General Medical Intensive Care Unit in 18 Months

Diagnosis	No.	
Suspected acute myocardial infarction	287	(48.4%)
Other cardiovascular diseases	73	(12.4%)
Acute self-poisoning	93	(15.7%)
Respiratory failure	56	(9.5%)
Acute renal failure	35	(5.9%)
Gastrointestinal haemorrhage	25	(4.1%)
Other medical emergencies	24	(4.0%)
Total ..	593	

TABLE II—Diagnosis in 73 Patients Admitted with Cardiovascular Diseases Other than Acute Myocardial Infarction

Complete heart block	27
Artificial pacemaker failures	13
Arrhythmias (not associated with acute myocardial infarction)	12
Severe heart failure	11
Massive pulmonary embolus	2
Complications after cardiac catheterization	3
Dissecting aneurysm	2
Hypertensive encephalopathy	2
Viral myocarditis	1

representing the work load associated with a specialist cardiac department, these figures indicate the proportion of these diseases likely to be seen in a general medical intensive care unit in an acute hospital. The initial diagnosis was confirmed in 71% of the patients admitted with suspected acute myocardial infarction (Collins, 1970).

The 93 patients admitted to the intensive care unit with self-poisoning represent about 30% of the total number of these patients who were admitted to the hospital during this period. With the exception of seven patients with salicylate poisoning and one patient with carbon monoxide poisoning, they were suffering from overdoses of sedative or antidepressant drugs, and all were unconscious on admission; their level of unconsciousness being at least grade II of the classification of Matthew and Lawson (1970). Five patients required assisted ventilation, but most required only supportive measures and there was no mortality.

Of the 35 patients with acute renal failure eight were haemodialysed in the intensive care unit and a further 13 received peritoneal dialysis. Of the 56 patients in acute respiratory failure who were admitted to the unit eight were in status asthmaticus, one was suffering from acute infective polyneuritis and another from myasthenia gravis, and 46 had severe acute or chronic airways obstruction. Intermittent positive-pressure respiration was required in the patient with polyneuritis and in eight patients with chronic airways obstruction. Including these patients, a total of 24 received intermittent positive-pressure respiration in the intensive care unit, with a mortality of 58%.

Discussion

NURSING STAFF

We agree with Crockett and Barr (1965) and Burn (1970) that the key to a successful unit is the efficiency of nursing staff. It is essential to maintain a permanent pool of skilled and experienced sisters and senior nurses on the unit, and it is important to obtain the co-operation of the nursing administrative staff. For the student nurses six weeks on the ward

forms part of their training, and an introduction to the practice of intensive care at this stage in their career may help later with recruitment of qualified nurses. In addition, it allays anxieties about the complexities of intensive care and its demands on the individual nurse.

The morale of nursing staff working in such a unit should be as high as possible; frequent informal seminars on intensive care and general medical topics given by medical staff of all grades and specialties are invaluable in fostering this and improving communications between the nursing and medical staff. Time spent teaching nurses and junior medical staff to recognize cardiac dysrhythmias, and something of the physiological and biochemical basis for the measurements and techniques they use, seems to have been appreciated. Similarly we have tried to encourage all members of the nursing and medical staff to ask questions about management of the patients and any techniques used.

The high nurse-to-patient ratio in an intensive care ward has far-reaching implications. In Starling ward and its sister surgical intensive care ward (Cornelius) the nurse-to-patient ratio is eight times that of the general wards. To supply the nurses to achieve that level of staffing means either recruiting extra staff or removing staff from other parts of the hospital. Additional recruitment is usually impracticable, and therefore nurses have to be found from existing establishment. The nursing administration have to be convinced of the need for intensive care to provide this additional staff, and their convictions are sorely tested at times of acute nursing shortage. Our experience convinced us and the nursing administration of the potential merits of progressive patient care. Planning the nursing requirements for an intensive care ward should therefore be considered as part of a programme of progressive patient care. Unless this is realized one has to face the possibility of closure of intensive care wards whenever nursing shortages worsen or, alternatively, closure of a number of general wards at such times to ensure the continued provision of intensive care.

MEDICAL STAFF

To have five general medical firms responsible for the care of patients calls for further comment. One of the problems posed by a general medical intensive care ward stems from the fact that no consultant can have sufficient competence to care for all the varied categories of illness, as seen in Table I. At present at Guy's Hospital specialist consultant physicians are attached to general medical firms and share junior staff with general physicians. Patients admitted with "specialist" emergencies are usually admitted under the specialist physician—that is, acute renal failure is usually managed by the renal physicians—but "general medical" emergencies, such as myocardial infarction, are admitted to the care of a general physician. Such a system is dictated mainly by the current state of balance between general medicine and the specialties, and as that balance alters so will the organization of clinical responsibility and care. The consultant with administrative responsibilities for the unit has to ensure that all patients have the requisite specialist care, and the problem is less a matter of obtaining appropriate special consultant advice than the difficulty of ensuring sufficient expertise of a specialist nature at junior staff level.

Most hospitals operate a general medical system rather than one of specialist divisions, and must therefore face the consequent operational inefficiencies encountered when planning a comprehensive intensive care ward. Intensive care works best with a small professional specialist team, and this is difficult to achieve within a general medical framework. Anaesthetists are not best suited to care for myocardial infarction and cardiologists are ill advised to pontificate on haemodialysis, and the all-purpose "intensivist" must remain a will-o'-the-wisp (Mushin and Lunn, 1969). A possible

compromise is to select those areas where intensive care has been shown to be valuable and presents a well-defined problem, such as post bypass surgery or coronary care, and thus bring the range of competence required down to that encompassed by a particular specialty.

The problem when trying to provide the most comprehensive intensive care cover possible is thus to reconcile a desire to minimize the number of intensive care units for reasons of economy with the fact that there are an increasing number of specialist teams claiming separate organizations. There is no obvious answer to this problem, and each hospital must provide a medical organization that is apt for local skills and resources.

Equipment

When estimating the cost of monitoring equipment it is well to remember that the electronics industry advise that the annual maintenance cost of such equipment may amount to 15% of the initial capital investment (Wolff, 1970). A certain degree of technical skill is usually required to operate such equipment, and this conflicts with the fact that the members of staff most often called on to use monitoring equipment are junior members of nursing and medical staff who change at frequent intervals. Hence the skills necessary to operate the apparatus must be easily acquired, as complex monitoring equipment may stand idle because it is too difficult to operate routinely. Similarly, the operational complexities may be too great to justify the clinical utility of the information which is produced by the equipment.

In our own unit we are fortunate in having the services of a hospital department of physics whose members are particularly interested in the techniques we employ. Similarly, one of us (T.R.E.) has been able, as an M.R.C. research assistant attached to the unit, to devote considerable time and thought to the equipment in use. Between us, we have quickly traced and corrected the faults which developed, and so maintained the equipment in working order for most of the time. Without these advantages we would have found it difficult to maintain operational efficiency. Each additional piece of equipment introduces a new source of potential artefactual information (Evans and Gorrell, 1971) and we again are fortunate in the ease with which we are able to seek the help of the physics department.

We have found visual and, more particularly, audible alarm systems unacceptable both to patients and to staff, and in our experience more than two-thirds of such alarms are false. Crook (1970) reported similar experience, and the habit of ignoring all such alarms is easily acquired. Having a higher staff-to-patient ratio with continuous observation of patients, we find such alarm systems unnecessary.

At present no reliable non-invasive equipment exists for measuring blood pressure automatically. We have used different types of indirect arterial manometry and have found them to be slower at taking and recording blood pressure than a properly trained observer using a sphygmomanometer. Similarly, current techniques for measuring respiratory rate with thermistors in the external nares are uncomfortable for the patient, and are unreliable when the patient is receiving oxygen by mask or nasal spectacles. Moreover, we have found that to ensure that the equipment continues to give accurate measurements, the nursing and medical staff have to devote an unacceptably large proportion of their working time to inspection and adjustment of the equipment. This means that the intensity of care of the patients is reduced unless more staff are recruited, and this is clearly undesirable and impracticable. In the foreseeable future these technical difficulties may be overcome and such equipment should then play an important part in intensive care, freeing the nursing staff from routine charting of pulse, blood pressure, and temperature, and allowing them more time for other tasks.

There is a danger that too much emphasis can be placed on patient monitoring, and this results in considerable capital expenditure. There is little evidence of a saving of staff as the result of using such apparatus, and as the machines are not reliable, extra work is often required to maintain their ability to produce satisfactory data. The effort required to acquire such data is often not justified in view of the marginal clinical utility of the information obtained. Such cost benefit considerations must be borne in mind when planning a unit, and in the Appendix we list equipment that we have found to produce most benefit at a modest outlay.

We would like to thank the M.R.C., who supported one of us while working in the unit.

Appendix

Proposed equipment for a four-bed general medical intensive care unit, with a guide to approximate capital expenditure:

	£
4 bedside oscilloscopes (Cambridge)	660
1 large-screen slave oscilloscope (Lan)	355
E.C.G. strip chart recorder (Hewlett-Packard)	390
1 synchronized D.C. defibrillator (Cardiac Recorders)	405
Half Haldane with rebreathing bags (Aimer Ltd.)	25
Dry spirometer (Vitalograph)	100
Wright peak flow meter (Airmed Ltd.)	40
Wright respirometer (B.O.C.)	50
Respirator (Bennett model PR 2)	390
Astrup A.M.I. (Radiometer)	855
2 electric thermometers including four probes (Light Laboratories)	190
Total	3,460

This list is intended as a guide, and the prices are approximate. The individual manufacturers mentioned are those whose equipment we have used and found reliable in service. We do not wish to imply that the items specified are necessarily the most suitable, or the cheapest of their kind.

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Medical Staffing and Training in Chest Diseases

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British Medical Journal, 1971, 1, 161-163

Summary

A survey of 164 area departments of chest diseases in England and Wales presents details of 321 consultants and 176 chest physicians in other career grades. During the past 10 years there have been 99 consultant and 76 senior hospital medical officer vacancies, with 61 and 23 replacements, respectively, of which only 22 and 8 were whole-time in chest diseases. Of the total, 119 consultants and 45 in other career grades are now aged 55 and over.

In most chest clinics the slowly diminishing work load from tuberculosis has been more than offset by increasing admission of other chest diseases, usually to fewer beds. Many areas need an increase in senior establishment and many require improved clinical facilities; some need both to bring them into line with official policy based on the recommendations of the Scadding report.

During the next five years there will be 52 consultant and 11 other senior career posts in chest diseases vacated through retirement. At least eight consultant appointments a year, in terms of whole-time equivalents, will be mandatory for at least

five years and probably for 10 years to maintain existing standards without allowance for essential improvements or the development of regional thoracic centres.

Present training schemes in the specialty cannot produce more than two or three trained candidates a year for these eight vacancies. The description of prospects in the specialty as "uncertain" deters young doctors from entering it and discovering how broad a spectrum of medicine it embraces. It is urgently necessary for schemes of training to be set up immediately in conjunction with a considerable increase in training posts at senior registrar level embracing both general and chest medicine.

Introduction

Diseases of the respiratory system, and more general disorders presenting with respiratory symptoms, occupy at least one-quarter of the time of general practitioners, and very many such cases demand hospital care. A committee of inquiry, set up by the Central Health Services Council (1968) under the chairmanship of Professor J. G. Scadding, reported that the special treatment of chest diseases would be necessary for the foreseeable future. It recommended that the district general hospital should provide a department of chest disease, that the general staffing of the department should follow the pattern appropriate to other special departments, and that the consultant should be the physician to the chest department, though

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