MEDICAL PRACTICE

Occasional Survey

Six Years of Multidisciplinary Intensive Care

J. A. BELL, R. D. BRADLEY, B. S. JENKINS, G. T. SPENCER

British Medical Journal, 1974, 2, 483-488

Introduction

The experience gained in the last decade of intensive care has been reported from several units.[1-7] These reports have emphasized the value of intensive observation and immediate treatment by trained personnel in highly organized areas which can be achieved only by segregation of selected acutely ill patients. Many larger hospitals tend to have separate intensive care areas for medical and surgical patients; some hospitals have separate coronary care, respiratory care, cardiac surgical care, and renal care units.

There is little published information from large general purpose intensive care units. The present study reviews the experience and outlines the pattern of the 2,896 admissions to the ten-bedded intensive care unit at St. Thomas's Hospital in the six years since it opened.

The Unit

The St. Thomas's Hospital group is an 860-bedded teaching hospital group serving a population of about 200,000 in South Central London.

Some 438 beds are situated in the main St. Thomas's Hospital on the Albert Embankment, where most acute medical and surgical patients lie. Since 1966 in the whole group there have been between 21,000 and 23,000 inpatient discharges in the acute specialities per year. Before September 1966 there was no intensive care unit (I.C.U.) and, apart from the care of patients immediately after cardiac surgery, all other aspects of support in acute illness—such as intermittent positive-pressure ventilation (I.P.P.V.) and peritoneal dialysis—were undertaken in the general wards. The desirability of concentrating such patients in one area became apparent and in 1966 a 10-bedded I.C.U. was opened in Stage I of the rebuilding programme.

Other special care units exist in the group:

(1) A 4-bedded area in the Lambeth Hospital with limited facilities for acutely ill adults.

(2) A chronic haemodialysis unit.

(3) A 12-bedded chronic respiratory unit at the South Western Hospital, which has supra-regional responsibility.

(4) A postoperative recovery room in the main theatre suite on the same floor as the I.C.U.

(5) A neonatal I.C.U.

The I.C.U. therefore serves as the acute respiratory care unit, coronary care unit, postoperative cardiac surgical care unit, acute dialysis unit, paediatric intensive care unit, as well as a general medical and surgical intensive care unit.

DESIGN

The unit (fig. 1) occupies the same floor area as a 28-bedded ward. A central service separates the two bed areas, and patients are segregated according to whether or not they are judged to be significantly infected. The clean and dirty areas are differentially air-conditioned and all areas are served by a voice-switched intercom.

EQUIPMENT

Each bed area is self-contained with its own power, suction, oxygen, and nitrous oxide outlets, the beds having adjustable rigid, radiolucent bases. Two Engstrom 150, one Engstrom 300, two Elema Schonander Servo 900, four Cape Mark 1, three Bird, and two Bennett ventilators are used and disinfected in a large formaldehyde and ammonia cabinet (Aseptor).

Four portable E.C.G. monitor/defibrillator units, one E.C.G. monitor, two arrhythmia detectors, and four portable combined E.C.G. and pressure monitoring units (each with three pressure transducers) are in routine clinical use. More complex cardiovascular investigations can be carried out in the unit using a trolley with facilities for recording simultaneously five intravascular pressures, cardiac output determination by thermal dilution,[8] and external and intracardiac E.C.G.

St. Thomas's Hospital, London S.E.1
J. A. BELL, M.B., M.R.C.P., Medical Registrar
R. D. BRADLEY, M.B., B.S., Clinical Physiologist
B. S. JENKINS, M.B., M.R.C.P., Senior Lecturer in Clinical Physiology
G. T. SPENCER, M.B., F.F.A.R.C.S., Consultant Anaesthetist

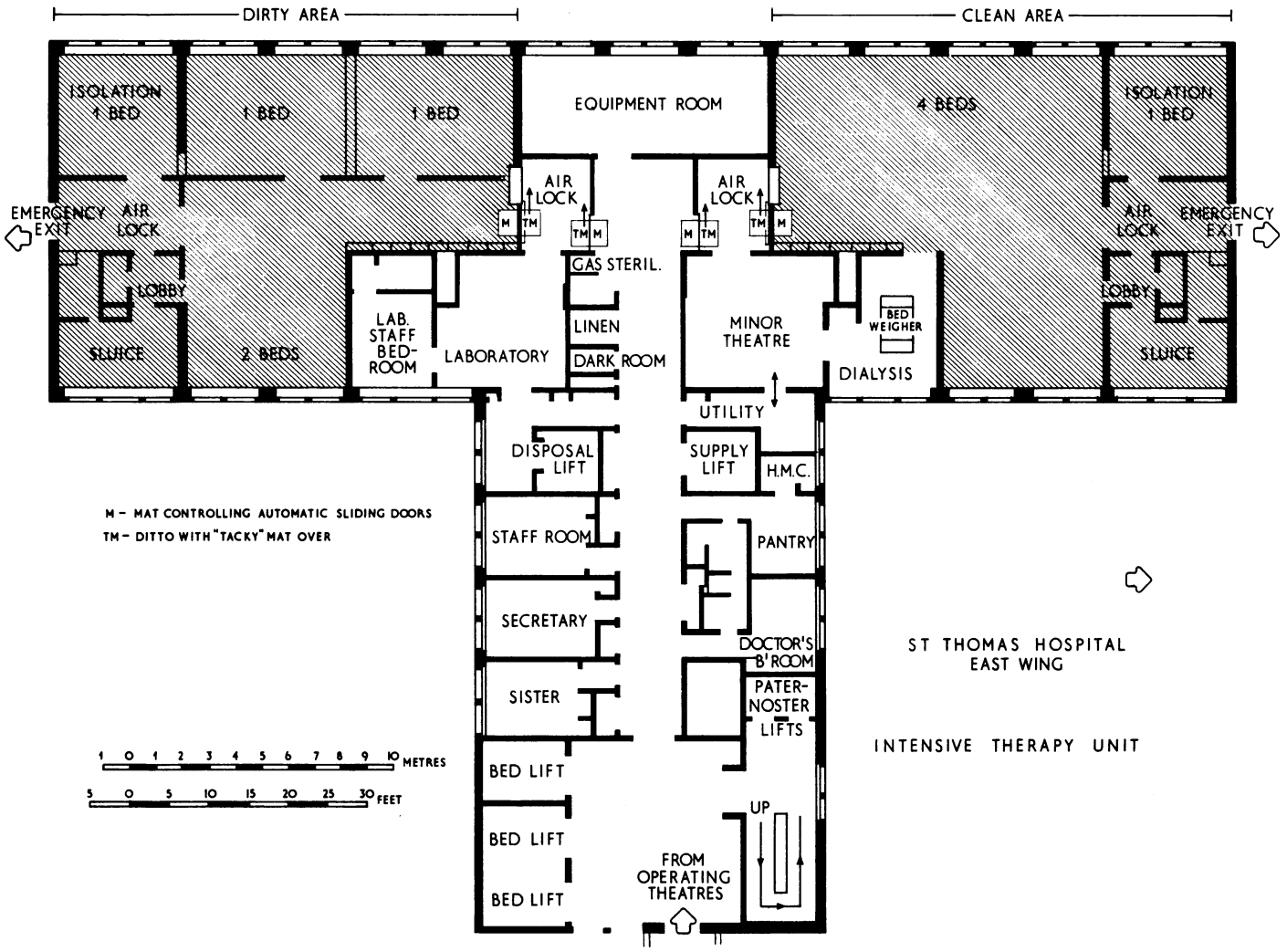

FIG. 1—Floor plan of I.C.U. Apart from the minor theatre, now office and laboratory accommodation, and the utility room (which serves as the house officers' laboratory), the unit is used as it was designed.

Two portable *x*-ray machines are kept in the I.C.U. and a portable image intensifier with videotape recording permits bedside pacemaker insertion, angiography, and gastrointestinal contrast studies. Acute haemodialysis using a Kolff twin-coil machine is carried out in the dialysis room and peritoneal dialysis in the bed areas, either manually or by use of an L.K.B. automatic cycling machine.

SERVICES

Arterial blood gases and pH (using Radiometer Clark and Severinghaus direct reading electrodes) and P.C.V. are estimated by the unit house officers. Special arrangements exist with all the main pathology departments and the *x*-ray department which enable analyses and *x*-ray examinations to be given priority. Plasma electrolytes and chest *x*-ray films are always available within ten minutes throughout the 24 hours.

Ventilators and sputum of ventilated patients are monitored micro-biologically each day and part of the Clinical Microbiology department now provides a clinical service to the I.C.U.

STAFFING

All admissions to the unit remain under the consultant who had the initial clinical responsibility. There are 2 full-time senior house officers, one always in the unit. A consultant physician with a speical interest in acute circulatory disorders works full time in the unit. A consultant anaesthetist, a senior lecturer in clinical physiology, and a rotating medical registrar are attached to the unit, but all have other interests and responsibilities.

The ideal nursing complement of one nurse per patient throughout the 24 hours is often not achieved but it is aimed to maintain a nursing staff of four sisters, four charge nurses, and a total of 40 trained nurses. Additionally there are two clinical instructors who organize a recognized diploma course, which lasts six months.

Three full-time technicians, working a shift system, maintain the ventilators, etc, and also the resuscitation trollies throughout the hospital. A fourth technician, also full time, maintains the pressure monitoring equipment, electrodes, etc.

CLINICAL NOTES

A full-time secretary is attached to the I.C.U. The resident house officer dictates admission notes on all new patients and daily follow-up notes on other patients.

The Survey

Details concerning patients admitted to the unit were obtained by retrospective analysis of the I.C.U. notes. Multiple admissions of one patient for the same problem (example, peritoneal dialysis) have not been included as separate episodes. Patients transferred to the unit from the general ward for elective medical procedures lasting less than a few hours, such as D.C. cardioversion and acute haemodialysis, did not acquire I.C.U. notes and are therefore not included in the survey.

Patients were followed until their discharge from the unit or their death in the unit, and they have been categorized accord-

ing to sex; age, date, and length of admission; diagnosis or diagnoses, and the main problem leading to their admission. Information was also abstracted on the use of endotracheal tubes, tracheostomy, I.P.P.V., and resuscitation.

The data was coded, entered on to punched cards, and analysed using the ANSWER survey analysis package on the University of London C.D.C. 6600 Computer.

Results

Between September 1966 and September 1972, 2,896 patients were admitted to the I.C.U.; 60·6% were male. The mean age on admission was 45·2 years (fig. 2). The annual throughput of patients has increased from 375 in 1967 to 630 in 1971. This is accounted for by an increase in the number of open heart operations, together with a greater use of the unit's coronary care facilities. More appreciation of the other facilities and advantages of the unit in succeeding generations of junior staff throughout the hospital has also resulted in an increased number of requests for admission for all other causes.

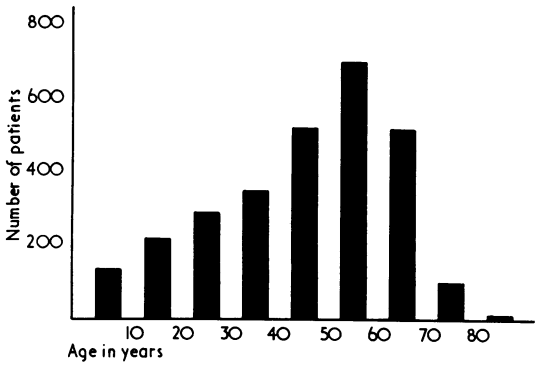

FIG. 2—Age distribution of admissions.

Altogether, 2,415 patients (83·4%) were discharged from the unit, nearly all to the general wards, but 41 to the chronic respiratory unit; 481 patients (16·6%) died in the unit. A total of 1,190 patients (41·1%) were admitted from the operating theatre. Most other patients came either from the wards (25·1%) or from the casualty department (24·8%). 3·7% of admissions came from other hospitals in the St. Thomas's group and 3·5% were admitted direct to the I.C.U. from hospitals outside the group. The remaining admissions came either from the cardiac catheter laboratory or from the *x*-ray department.

The duration of stay in the unit varied from less than one day to 435 days (mean 4·38 days); 34·1% of patients stayed less than two days, 70·9% less than five days, and only 2·3% stayed longer than 25 days.

Table I shows the distribution of patients according to specialty. A further analysis of admissions is provided by considering the main diagnostic categories and the indications for admission.

TABLE I—*Admission by Specialty*

	No. of Patients	Percentage
Cardiac surgery	771	26·6
General surgery	504	17·4
Dental surgery	147	5·1
Thoracic surgery	47	1·6
E.N.T. surgery	33	1·1
Obstetrics and gynaecology	30	1·0
Orthopaedic	11	0·4
General medicine	972	33·6
Renal medicine	206	7·1
Cardiology	100	3·5
Neurology	31	1·1
Paediatrics	28	1·0
Other	16	0·5
Total	2,896	100

Diagnostic Categories

SURGICAL PATIENTS

Some 1,543 patients were admitted under surgical specialties (including obstetrics and gynaecology); 716 patients came for postoperative care after cardiac surgery. A further 55 cardiac surgical patients were admitted with problems other than those related to immediate postoperative care. Other substantial categories included 264 patients with abdominal surgical problems, of whom 121 had emergency operations, and vascular surgery with 100 patients, 37 of whom were emergencies—mostly leaking abdominal aneurysms. Some 147 patients were admitted for observation of the airway after faciomaxillary surgery.

St. Thomas's Hospital is situated away from roads carrying fast-moving traffic and serious trauma is seen relatively infrequently; 157 patients were admitted with problems related to trauma. Head injury (74 patients), multiple injuries (31 patients), and chest injuries (25 patients) were the most common indications for admission.

Surgical patients were referred from four main sources: firstly, 925 patients were admitted for predicted postoperative care; secondly, 308 patients were admitted from the operating theatres following unexpected surgical or anaesthetic complications after extensive surgery, most without any single system failure being recorded as the cause for their admission. A total of 67 were admitted with postanaesthetic respiratory failure, 28 with postanaesthetic coma, and 42 with multiple system disease. Thirdly, 41 patients were admitted for resuscitation before emergency surgery; while, fourthly, 197 patients came from the general surgical wards because of late postoperative complications. Respiratory failure (53 patients), fluid and electrolyte problems (23), severe sepsis (22), and renal failure (14) were the most common problems. Massive pulmonary embolism (12) and myocardial infarction (seven) were relatively rare.

The remaining 72 surgical patients had not been operated on and were admitted for a variety of reasons.

MEDICAL PATIENTS

A total of 1,353 patients were admitted under medical specialties (diagnosis on admission shown in table II). A patient admitted with more than one principal diagnosis—e.g., acute diabetic ketoacidosis and acute myocardial infarction—has had both diagnoses included.

Most acute medical admissions came under the care of one of the four general firms responsible for acute admissions, irrespective of their complaint. Thus the 100 patients admitted to the I.C.U. under the cardiology firm does not represent the extent of acute cardiology. Over 90% of medical admissions came from either the casualty department or from the wards, in roughly equal numbers.

Indication for Admission

An attempt has been made to define the major problems in the management of each patient precipitating admission (table III). Through oversimplification such a classification conceals the relative frequency of multiple problems. Thus, though the need for I.P.P.V. constituted the major indication in 148 patients, a further 939 patients received I.P.P.V. in the unit either because this became indicated subsequently during their stay or because I.P.P.V. alone did not constitute the main indication for admission.

Artificial Ventilation

Some 1,087 patients (37·5% of admissions) received artificial ventilation.

TABLE II—*Diagnosis on Admission for "Medical" Patients*

Cardiovascular disease:	
Myocardial infarct	412
Other ischaemic heart disease	88
Suspected myocardial infarct	42
Pulmonary embolism	39
Dissecting aneurysm	12
Valvular heart disease	80
Cardiomyopathy	14
Tamponade	12
Other	39
Total	738
Renal disease:	
Chronic renal failure	136
Acute renal failure	80
Renal transplant	30
Chronic dialysis complications	14
Transplant complications	11
Other	3
Total	274
Neurological disease:	
Cerebrovascular accident	32
Status epilepticus	22
Polyneuritis	22
Encephalitis	11
Myasthenia	10
Other	20
Total	117
Respiratory disease:	
Asthma	19
Pneumonia	47
Acute-on-chronic respiratory failure	49
Respiratory paralysis	48
Upper respiratory tract obstruction	20
Spontaneous pneumothorax	5
Drug induced respiratory failure	4
Other	4
Total	196
Self-poisoning:	
Barbiturates	38
Salicylates	14
Methaqualone/Chlorpheniramine	16
Tricyclic Antidepressants	16
Other	19
Combination of above	33
Unknown	25
Total	161
Miscellaneous:	
Diabetic coma	24
Hepatic failure	12
Septicaemia	48
Suspected septicaemia	54
Agranulocytosis	15
Coagulopathy	17
Gastrointestinal bleeding	13
Acute epiglottitis	5
Total	188

TABLE III—*Distribution and Mortality of Patients According to Indications for Admission*

Indication for Admission	No. of Patients	Percentage Mortality
Postoperative cardiac care	716 (24·7%)	12·0
Observation after other major surgery	98 (3·4%)	3·1
Cardiac monitoring	236 (8·1%)	4·2
Hypovolaemia	49 (1·7%)	16·3
Pulmonary oedema	75 (2·6%)	22·6
Dysrhythmia	132 (4·6%)	7·5
Heart block	39 (1·4%)	12·8
Cardiogenic shock	28 (1·0%)	78·5
Other circulatory problems	118 (4·1%)	23·7
Management after cardiac arrest	202 (7·0%)	47·5
Coma	251 (8·7%)	12·0
Airway obstruction	164 (5·7%)	0·0
I.P.P.V.	148 (5·1%)	26·4
Physiotherapy	104 (3·6%)	10·6
Tracheostomy care	44 (1·5%)	22·7
Severe sepsis	41 (1·4%)	36·6
Electrolyte problems	85 (2·9%)	12·9
Acute renal dialysis	178 (6·1%)	7·8
Isolation	42 (1·4%)	2·4
Multiple system problems	146 (5·0%)	50·7
Total	2,896 (100%)	16·6

TABLE IV—*Indications for I.P.P.V. in 1,087 Patients*

Indication for Artificial Ventilation	No. of Patients	Percentage Mortality
Post cardiac surgery	548 (50·4%)	15·9
Post anaesthetic respiratory failure	88 (8·1%)	39·8
Late postoperative respiratory failure	48 (4·4%)	47·9
Acute pneumonia	19 (1·7%)	47·4
Chronic obstructive airways disease	22 (2·0%)	18·2
Post cardiac arrest	163 (15·0%)	61·3
Self poisoning	43 (3·7%)	4·6
Other coma	40 (3·7%)	70·0
Acute pulmonary oedema	29 (2·7%)	37·9
Circulatory collapse	19 (1·8%)	78·8
Acute respiratory paralysis	22 (2·0%)	27·3
Chronic respiratory paralysis	14 (1·3%)	0·0
Status epilepticus	12 (1·1%)	16·7
Chest trauma	20 (1·8%)	40·0
Total	1,087 (100%)	30·4

Of these, 12, transferred from the chronic respiratory unit, were ventilated in a tank ventilator, but the remainder were ventilated by I.P.P.V. I.P.P.V. lasted from less than one day to 435 days (mean duration 4·92 days). Table IV shows the indications for instituting I.P.P.V. and the mortality in the different groups.

A total of 1,108 patients were managed with plastic oral endotracheal tubes in situ for at least part of their stay. Patients arriving from outside the unit with rubber tubes in situ have their tubes changed if prolonged intubation appears necessary. With the avoidance of excessive cuff pressure, scrupulous attention to humidification, and emphasis on adequate sedation, the techniques in the unit do not differ from accepted modern practice.

The mean duration of endotracheal intubation was 2·22 days (fig. 3). Only seven patients had endotracheal tubes in place for longer than 10 days, the longest being 18 days in a patient with a bleeding diathesis who was comatose after a cardiac arrest. In 91·5% of patients with endotracheal tubes the indication for intubation was to provide an airway for I.P.P.V. Isolation of the airway in comatose patients provided the indication in 7·7% and upper respiratory tract obstruction in 0·8%.

Extubation in patients who had received long periods of I.P.P.V. is necessarily somewhat hazardous, and a total of 229 patients were extubated and subsequently required reintubation. Thus 162 patients were reintubated once, 55 twice, seven three times, and five four times.

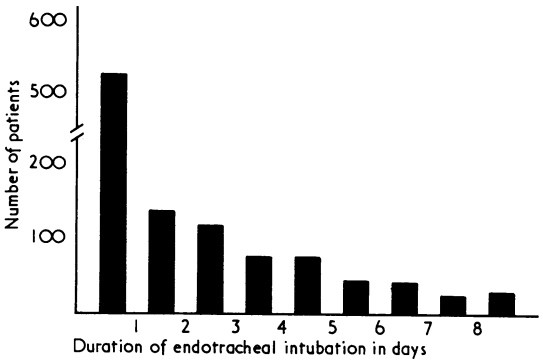

FIG. 3—Duration of endotracheal intubation.

Some 177 intubated patients underwent tracheostomy when it became apparent that subsequent management was likely to require prolonged I.P.P.V. or isolation of the airway. The mean duration of endotracheal intubation in these patients was 3.99 days. Altogether 300 patients with tracheostomy were managed in the unit and in 68% the indication for tracheostomy was to provide a route for I.P.P.V.

Resuscitation

Resuscitation from cardiac arrest was attempted in 251 patients and in 89 patients a stable circulatory state was restored; follow-up of these patients showed that 31 survived to be discharged from hospital. A detailed analysis of these patients and of patients admitted after cardiac arrest which occurred outside the unit will be published elsewhere.[9] Multiple cardiac arrests occurred in 18 patients, four of whom were discharged from hospital.

Resuscitation from cardiac arrest was not attempted in 319 patients who died in the unit—170 of whom (more than half) were judged to have irreversible brain damage.

Discussion

The pattern of admissions to an I.C.U. will reflect the activities of the hospital it serves and the interests of the staff working on the unit. Possibly 1% of patients admitted to a district hospital or hospital group will need intensive therapy at some stage.[10] The 2,896 patients admitted to the St. Thomas's Hospital I.C.U. represent 2·3% of total admissions. The explanation for this

high figure perhaps lies in the tendency for complex cases to gravitate to teaching hospitals and the increased likelihood of such cases requiring intensive care.

It is very much the exception for large teaching hospitals to have multidisciplinary I.C.U.'s. Reports from district general hospital I.C.U.'s,[1 6 7 11] coronary care units both in the specialist hospitals[12-15] and in district hospitals,[16-18] respiratory care units,[19-21] and general medical I.C.U.'s[4 3] have been published. There have been no reports relating to large multidisciplinary I.C.U.'s such as the unit in this hospital.

To this extent the figures relating to patient admissions to this unit are peculiar to the hospital. Thus the mortality for post-operative cardiac surgical patients appears high when compared with purely cardiothoracic I.C.U's, as less complicated patients are looked after postoperatively in the recovery room. Also medical management of the same disease changes; the number of patients with myocardial infarction who are treated initially in the unit is increasing annually, but with an increasing proportion of uncomplicated cases.

The figures from this I.C.U. show that a wide variety of acute illnesses have been looked after in one unit with the participation of full-time medical staff. The philosophy behind this approach is that the medical, nursing, and technical skills and the apparatus involved in looking after severe illness are common to patients with a wide variety of clinical conditions.

The problems in running such a unit, together with any inherent disadvantages, cannot be clearly defined. The experience of the last six years in this unit has emphasized some of the obvious areas of importance.

DESIGN OF THE UNIT

With few exceptions the design of the unit has proved to be satisfactory.

A minimum of 200 ft² (18·5 m²) per bed area has been recommended for I.C.U's in district general hospitals.[22] The large bed areas in the St. Thomas's I.C.U., with 330 ft² (31 m²) per patient, allow flexibility in the allocation of space. The relative spaciousness creates an impression of tranquility in the face of much activity. The separate clean and dirty areas allow segregation of infected patients and the single cubicles, though extravagant in nursing time, afford some privacy for less seriously ill patients. The minor operating theatre has not proved valuable and is no longer used as such.

The Department of Health and Social Security recommends an equipment store of 200 ft² (18·5 m²) for an average-sized unit of 6-8 beds.[22] An area of 360 ft² (33 m²) allocated for equipment storage in this unit soon proved to be inadequate.

Though preferably relatives staying for long periods should not be actually in the I.C.U. all the time, the unit does need short-term waiting accommodation.

SELECTION OF PATIENTS

That it is proper as well as practicable to monitor patients with the acute manifestations of ischaemic heart disease in a general I.C.U. is not a proposition that all accept.[2 23] Monitoring patients in a general ward confers no benefits[24] but it would seem illogical to admit patients to the I.C.U. only after cardiac arrest has occurred. The alternative arrangement of separate coronary care facilities has to have overwhelming advantages, which have not become apparent in six years in this hospital, if the extra cost and inconvenience are to be justified.

No major problems occur because patients with a wide variety of diagnoses are admitted to the same unit.

The basic nursing and medical skills are common to the management of acutely ill patients, and it is characteristic of acutely ill patients that disordered physiology is rarely confined to one system. The establishment of a separate acute artificial ventilation unit in St. Thomas's Hospital would create many problems and solve none. Only a small proportion of the 1,087 patients who received I.P.P.V. were admitted solely for this aspect of support (see table IV). Perhaps if patients are admitted to a multidisciplinary I.C.U., at least assumptions that place rigid restrictions on their management are less likely to be made.

Cross-infection with wound organisms has not proved to be a major problem, though many patients are grossly infected on admission. How far the air conditioning and layout have contributed to this has not been and probably could not be determined. Bacteriological monitoring has identified ventilators and humidifiers as being the most important source of cross-infection[25] and it appears that formaldehyde chamber disinfection has abolished this.

MEDICAL AND NURSING STAFFING

The efficient running of any I.C.U. depends on a corps of well-trained nurses. This is achieved by maintaining some continuity at the level of nursing sisters. The establishment of a diploma course for nurses means that appreciable proportion of nurses who have been through the course stay on working in the unit for a further period. Nevertheless, the role of medical staff in I.C.U's is contentious. There are three main areas for discussion.

Firstly, should they be attached full time to an I.C.U. at all? In the St. Thomas's I.C.U. medical staff are attached whole time to the unit at senior house officer, registrar, and consultant level. The advantage of such a system is that it assures the constant availability of staff experienced in most medical emergencies and the specialized techniques involved. Such staffing of an I.C.U. demands special relationships within the I.C.U. team and with the other teams in the hospital. Some will wish to be involved in decisions of any magnitude and others to leave the management entirely to the I.C.U. team.

Secondly, if there is to be a full-time medical staffing of intensive care units, then to which basic specialty should the medical staff be committed? That this problem is unresolved is witnessed by the variety of answers proffered.[26-28] Though much of the discussion has been on the role of anaesthetists in intensive care, the reasoned arguments of Mushin and Lunn[26] apply equally to any specialty. An interest in and a knowledge of acute circulatory, respiratory, neurological, and metabolic disturbances would seem to be the only prerequisites.

The third problem concerns the training of junior staff in the different aspects of intensive care. Experience can be gained only by clinical involvement and responsibility; but intensive care is multidisciplinary and not all aspirants could be trained without the period of time spent on the I.C.U. by each doctor being so short that clinical responsibility would become impracticable.

RESUSCITATION

Though the techniques of cardiopulmonary resuscitation are likely to be highly developed in any efficient I.C.U., a preoccupation with this unrewarding aspect of medicine is inappropriate. Emphasis on prevention and correction of predisposing causes of cardiac arrest is likely to be of more benefit. It should be recognized that attempted cardiopulmonary resuscitation is often not indicated even in an intensive care area where few patients with incurable disease are admitted. In 319 out of 481 patients who died in the unit cardiopulmonary resuscitation was not attempted. Failure to recognize this will lend support to the criticism that I.C.U.'s encourage unnecessarily aggressive treatment or that patients are not allowed to die in peace in I.C.U's.

Objective evidence for the value of I.C.U's is inevitably hard to obtain, though there is some evidence for a reduction in the incidence of cardiac arrest from ventricular arrhythmias in coronary care units.[13 29] The number of patients who survive in I.C.U's with problems which would be considered fatal when treated conventionally in a general ward is impressive to those concerned but hardly acceptable as evidence. Most patients admitted to a general I.C.U. such as that at St. Thomas's are not readily categorized. The complexity of their problems makes it

impossible to compare their outcome with matched control patients looked after in a conventional manner in a general ward—even if this were considered ethical.[2 3 0] It is significant that a working party on intensive care[1 0] was unable to find any I.C.U. that had been discontinued once started.

Intensive care implies a concept, a structure and a function. The concept is one of highly specialized care with inordinate and time-consuming attention to detail; the structure will be dictated predominantly by the whim of architects and the space available. The function of such units is to provide the standard of care the concept implies and it is irrelevant what label is applied—that is, whether coronary, respiratory, or surgical, etc. This review has aimed at showing that a general-purpose intensive care unit can provide a service which covers all disciplines and that a multiplicity of units, varying only in name but not in purpose, is at least unnecessary in this hospital and at worst grossly wasteful of medical, nursing, and technical staff.

We are grateful to the consultant staff of St. Thomas's Hospital for permission to publish the results of the survey, and to Miss Mary Evans for secretarial help.

References

1 Crockett, G. S., and Barr, A. *British Medical Journal*, 1965, **2**, 1173.
2 Burn, J. M. B., *Lancet*, 1970, **1**, 1040.
3 Skjaeggestand, O., Grendahl, H., Hjermann, I., and Swertssen, E., *Acta Medica Scandinavica*, 1970, **187**, 275.
4 Clark, T. J. H., Collins, J. V., Evans, T. R., and Tweedily, K., *British Medical Journal*, 1971, **1**, 158.
5 Mason, S. A., *Acta Anaesthesiologica Scandinavica*, 1967, Supp. 23, 1A.
6 Hoyle, J. R., and Rowe-Jones, D. C., *Postgraduate Medical Journal*, 1969, **45**, 27.
7 Tanser, A. R., and Whetten, B. G., *British Medical Journal*, 1973, **3**, 227.
8 Branthwaite, M. A., and Bradley, R. D., *Journal of Applied Physiology*, 1968, **24**, 434.
9 Bell, J. A., and Hodgson, H. J. F., *Brain*, in press.
10 *Planning Unit Report No.* 1. London, British Medical Association, 1967.
11 Taylor, J., and McTaggart, D., *Medical Journal of Australia*, 1972, **1**, 915.
12 Lawrie, D. M., *et al.*, *Lancet*, 1967, **2**, 109.
13 Lown, B., Fakhro, A. M., Hood, W. B., and Thorn, G. W., *Journal of the American Medical Association*, 1967, **199**, 188.
14 Goble, A. J., Sloman, G., and Robinson, J. S., *British Medical Journal*, 1966, **1**, 1005.
15 Thomas, M., Jewitt, D. E., and Shillingford, J. P., *British Medical Journal*, 1968, **1**, 787.
16 Reynell, P. C., *British Medical Journal*, 1969, **2**, 502.
17 Mackenzie, G. J., Ogilvie, B. C., Turner, T. L., Fulton, M., and Lutz, W., *Lancet*, 1971, **2**, 200.
18 Pentecost, B. L., and Mayne, N. M. C., *British Medical Journal*, 1968, 1968, **1**, 830.
19 Bigelow, D. B., Petty, T. L., and Ashbaugh, D. G., *Medical Clinics of North America*, 1967, **51**, 323.
20 Campbell, D., Reid, J. M., Telfer, A. B. M., and Fitch, W., *British Medical Journal*, 1967, **4**, 255.
21 Barch, W., and Slawson, K. B., *British Journal of Anaesthesia*, 1965, **37**, 574.
22 *Hospital Building Note Number 27.* Intensive Therapy Unit. Department of Health and Social Security. H.M.S.O., London, 1970.
23 Pentecost, B. L., Mayne, N., and Lamb, P., *British Medical Journal*, 1967, **3**, 298.
24 Hubner, P. J. B., Goldberg, M. J., and Lawson, L. W., *British Medical Journal*, 1969, **1**, 815.
25 Phillips, I., and Jenkins, B. S. To be published.
26 Mushin, W. W., and Lunn, J. N., *British Medical Journal*, 1969, **2**, 683.
27 Hunter, A. R., *Lancet*, 1967, **1**, 1151.
28 Intensive Care Units. Progress in Anaesthesiology. Proceedings of the Fourth World Congress of Anaesthesiologists. Excerpta Medica (1968), 489-491.
29 Norris, R. M., Brancot, P. W. T., and Lee, A J., *Lancet*, 1969, **1**, 278.
30 Griner, P. F., *Annals of Internal Medicine*, 1971, **78**, 581.

Around Europe

Clinical Medicine and Research in Belgium

P. A. EMERSON, M. S. LEWIS

British Medical Journal, 1974, **2**, 488-490

In January 1974, on behalf of the British Council, we spent a week visiting various medical organizations in Belgium—including the medical faculties at Ghent, Louvain, Brussels, Antwerp, and Liège. Everyone was most welcoming and friendly and, to our surprise, there was no language problem. The doctors all spoke excellent English and in many laboratories English was the language of normal communication; clinical meetings and conferences were often conducted in English.

There are two official languages in Belgium. In the northern, Flemish part Dutch is spoken and in the southern Walloon part, French. There are also some German-speaking communities near the German border. The total population is about ten million. There have been historical conflicts of interest between the French-and the Dutch-speaking populations, and after the troubles in the late 1960s, those universities in which both languages were used—namely, the Free University of Brussels and the Catholic University of Louvain—were divided to form separate French-and Dutch-speaking universities, so that there are now two Dutch-speaking universities (Katholieke Universiteit te Leuven and Vrije Universiteit te Brussel) and two French-speaking universities (Université Catholique de Louvain and Université Libre de Bruxelles). In the case of Louvain/Leuven, the French-speaking university has already moved some of its departments and faculties to a new site at Wavre, and part of the medical faculty to the outskirts of Brussels.

Westminster Hospital, London SW1P 2AP
P. A. EMERSON, M.D., F.R.C.P., Consultant Physician

The British Council, Amsterdam
M. S. LEWIS, M.A., PH.D., Science Officer, Benelux

Health Services

The Belgians are an independent and industrious people with a high regard for equality of opportunity and freedom of choice. Their health service arrangements are very complicated. In essence they are financed by the patients' payments (on a scale which is fixed nationally) to one of several private insurance schemes which provide for most aspects of social security.

The patient can go direct to any doctor, whether he be G.P. or specialist. The patient does not have to be referred by a G.P. to see a specialist, and the specialist is under no obligation to tell the G.P. of his findings. The various doctors are therefore in