

**RECENT ADVANCES IN**  
**I**  
**INTENSIVE THERAPY**

Edited by I. McA. Ledingham  
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# RECENT ADVANCES IN INTENSIVE THERAPY

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I. McA. LEDINGHAM

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# RECENT ADVANCES IN INTENSIVE THERAPY

I. McA. LEDINGHAM

*Reader in Surgery,  
University of Glasgow;  
Consultant Clinical Physiologist,  
Intensive Therapy Unit, Western Infirmary,  
Glasgow*

# Preface

The Practice of Intensive Therapy has emerged as a going concern only within the past decade but its growth rate in these early years has been dramatic. Not only has its influence spread extensively to involve most progressive medical centres but in recent times it has begun to generate its own specialised research techniques, procedures and thinking.

Some of the more notable achievements of the past decade are included in this volume. Clearly the personal bias of the editor has influenced the final choice of topics and authors, and no attempt has been made to produce a comprehensive practical manual of Intensive Therapy. The text is intended to have a wide appeal to all who are involved in care of the acutely ill whether in the Intensive Therapy Unit, in the general ward, or in transit to hospital. Only a few of the highly specialised techniques have been included since their practical feasibility outside a small number of centres is uncertain.

The understandable desire of individual authors to develop their themes in detail has been contained in the interests of including as varied a selection of subject matter as possible. The precise role of Intensive Therapy in modern medical practice cannot be assessed at this stage but data such as those contained within these covers should help to provide a sound basis for future analysis.

Glasgow, 1977

I. McA. Ledingham

# Contributors

**S. BRUINS**

Fellow in Infectious Diseases, Boston University School of Medicine, Boston, Massachusetts, USA

**P. C. CHANG**

University of California, Los Angeles, USA

**J. M. CIVETTA**

Professor of Surgery, Anesthesiology, Medicine and Pathology, University of Miami School of Medicine; Miami, Florida, USA

**D. E. CRAVEN**

Fellow in Infectious Diseases, Boston University School of Medicine, Boston, Massachusetts, USA

**H. DUDLEY**

Director, Professor of Surgery, Academic Surgical Unit, St Mary's Hospital, London, England

**B. EISEMAN**

Professor of Surgery, University of Colorado School of Medicine; Director of Surgery, Denver General Hospital, Colorado, USA

**PH. GAJDOS**

Professor agrégé, Clinique de Réanimation, Hôpital Raymond Poincaré, Garches, France

**D. G. GILMOUR**

Surgical Research Fellow, University Department of Surgery, Western Infirmary, Glasgow, Scotland

**G. GLAZER**

Assistant Director, Academic Surgical Unit, Consultant Surgeon, St Mary's Hospital, London, England

**M. GOULON**

Professor, Clinique de Réanimation, Hôpital Raymond Poincaré, Faculté de Médecine, Garches, France

**H. L. GREEN**

Consultant in Clinical Physiology, Division of Bioengineering, Clinical Research Centre, Harrow, Middlesex, England

**A. GRENVIK**

Professor of Anesthesiology/CCM; Director, Division of Critical Care Medicine, Department of Anesthesiology, Presbyterian University Hospital, Pittsburgh, Pennsylvania, USA

**A. P. HOTHERSALL**

Anaesthetic Research Fellow, University Department of Surgery, Western Infirmary, Glasgow, Scotland

**B. JENNETT**

Professor of Neurosurgery, Institute of Neurological Sciences, Southern General Hospital, Glasgow, Scotland

**P. JONES**

Director, Newcastle Haemophilia Centre, Department of Haematology, Royal Victoria Infirmary, Newcastle upon Tyne, England

**C. T. LAMBREW**

Chairman, Department of Medicine, Nassau County Medical Center; Professor of Medicine, State University of New York at Stony Brook, New York, USA

**I. McA. LEDINGHAM**

Reader in Surgery, University of Glasgow: Consultant Clinical Physiologist, Intensive Therapy Unit, Western Infirmary, Glasgow, Scotland

**C. E. LINDHOLM**

Associate Professor, Department of Otolaryngology, University Hospital, Uppsala, Sweden

**W. R. McCABE**

Professor of Medicine and Microbiology, Director, Division of Infectious Diseases Boston University School of Medicine, Boston, Massachusetts, USA

**A. C. MacCUISH**

Consultant Physician in General Medicine, Royal Infirmary, Glasgow, Scotland

**H. MUELLER**

Professor of Medicine; Chief, Division of Cardiology, St Louis University School of Medicine, St Louis, Missouri, USA

**I. M. MURRAY-LYON**

Consultant Physician, Gastrointestinal Unit, Charing Cross Hospital, London, England

**L. NORTON**

Associate Professor of Surgery, University of Colorado School of Medicine; Associate Director of Surgery, Denver General Hospital, Colorado, USA

**L. D. PORTIGAL**

Center for the Critically Ill, University of Southern California School of Medicine, Los Angeles, USA

**L. F. PRESCOTT**

Consultant Physician, Regional Poisoning Treatment Centre and University Department of Therapeutics, Royal Infirmary, Edinburgh, Scotland

**A. T. PROUDFOOT**

Consultant Physician, Regional Poisoning Treatment Centre and University Department of Therapeutics, Royal Infirmary, Edinburgh

**J. S. ROBSON**

Professor of Medicine, Department of Medicine, University of Edinburgh; Consultant Physician, Edinburgh Royal Infirmary; Consultant Physician-in-Charge, Medical Renal Unit, Edinburgh Royal Infirmary, Edinburgh, Scotland

**W. SHOEMAKER**

Professor of Surgery, UCLA School of Medicine; Chief, Acute Care Center, Harbor General Hospital, Torrance, California

**H. C. SMITH**

Chief Physics Technician, University Department of Surgery, Western Infirmary, Glasgow, Scotland



**J. C. STODDART**

Consultant in Charge, Intensive Therapy Unit, Royal Victoria Infirmary, Newcastle upon Tyne, England

**G. M. TEASDALE**

Senior Lecturer in Neurosurgery, Institute of Neurological Sciences, Southern General Hospital, Glasgow, Scotland

**D. A. TIBBUTT**

Consultant Physician, Worcester Royal Infirmary, Worcester, England

**P. N. TREWBY**

Medical Registrar, Liver Unit, King's College Hospital, London

**G. WADDELL**

Orthopaedic Research Fellow, University Department of Surgery, Western Infirmary, Glasgow, Scotland

**M. H. WEIL**

Director and Clinical Professor of Medicine and Biomedical Engineering, Center for the Critically Ill, University of Southern California School of Medicine, Los Angeles, USA

**C. WELLER**

Scientific Worker, Division of Bioengineering, Clinical Research Centre, Harrow, Middlesex, England

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# I. Care of the critically ill

*I. McA. Ledingham*

The last two decades have witnessed something of a revolution in the medical care of patients suffering from acute life-threatening ailments. This volume represents an account of some of the recent developments in the area of 'intensive care' although the definition of 'intensive care', as presently understood in the United Kingdom, has been extended and more closely approximates to the North American concept of 'critical care medicine' (CCM). CCM is described as encompassing 'resuscitation, life-support and definitive medical care for the critically ill and injured (a) at the scene of an emergency, (b) during transportation, and (c) in hospital until management by conventional medical means is appropriate' (Society of Critical Care Medicine, 1973). CCM thus includes both emergency medical care and intensive care, with resuscitation forming an integral part of both aspects.

Acute care services in the United Kingdom are rarely integrated in the manner described above although there are signs that a wind of change is blowing, and perhaps one of the benefits that may emerge from the present economic squeeze is rationalisation of all aspects of acute medical care (Himsworth, 1976; Jennett, 1976). Any attempt to re-organise acute medical care should have, as one of its principal aims, the more efficient use of scarce and costly resources. A more careful selection of patients is required, with a reduction in the number of those who at present occupy acute care beds but derive no long-term benefit. The chapters immediately following this introduction indicate the direction of current clinical research designed to resolve some of these complex problems.

## REQUIREMENT FOR INTENSIVE CARE

The need for intensive care may arise as a result of an acute deterioration in a pre-existing chronic condition, e.g. respiratory or renal disease, as a complication of a surgical operation, or, completely unannounced, as in the case of myocardial infarction or following a road traffic accident.

Until recently, patients with such acute problems were cared for in the same traditional, 'Nightingale' ward areas as other, less ill patients. This system had a number of advantages including continuity of patient care by one clinical team and the opportunity for both medical and nursing staff to be in daily contact with all severities of illness. A major disadvantage of this system was that it was uneconomic in staff since even one critically ill patient in a ward tended to monopolise the attention of nurses and doctors, occasionally to the detriment of other patients. The inevitable solution was to bring all the critically ill patients within a hospital to a central area where they could be cared for by specially trained staff familiar with complex apparatus.

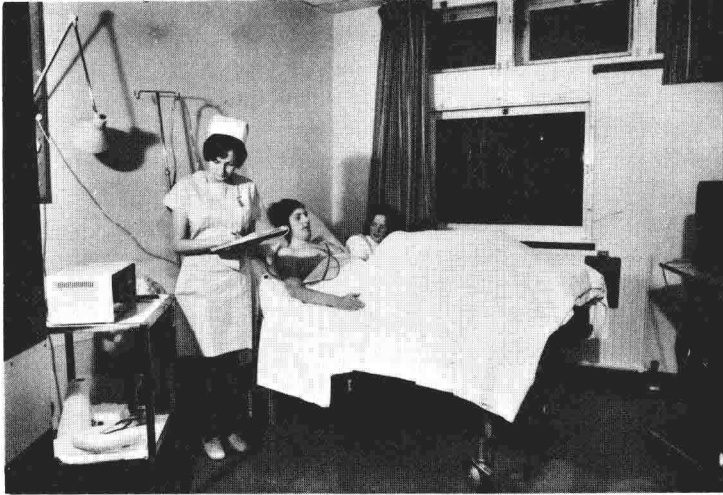
In the modern hospital the spectrum of intensive care units is wide (Kinney, 1970). Most hospitals possess some form of postoperative recovery area and in days gone by this

area was often used for resuscitation of other types of acutely ill patients. With the passage of time separation of these two activities was inevitable. Special units were developed to handle specific acute conditions, e.g. coronary care and respiratory care units. The degree of further specialisation is determined by such factors as the size of the hospital, the patient load within specialities and, to a lesser extent, the enthusiasm of individual clinicians. Patient load is important in that experience has shown, on the one hand, that the minimum number of beds which constitutes a viable Intensive Therapy Unit (ITU) is four and, on the other hand, that maintenance of the high standard of medical and nursing care implicit in the term 'intensive care', becomes a problem in units containing more than about 10 patients. This has given rise to the rationale of intensive care complexes involving the close approximation of several different types of ITUs with the advantages of a nursing establishment under unified administration and pooled medical and technical expertise. An extension of this concept on a regional basis, aims to coordinate the activities of intensive care services in several neighbouring hospitals (p. 239).



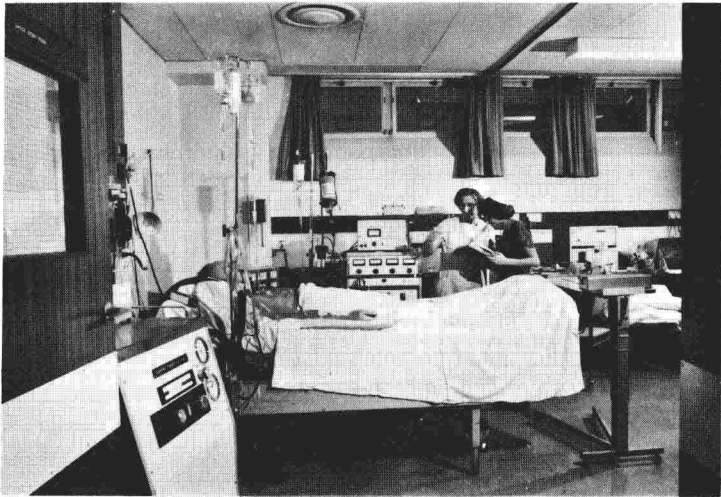
**Fig. 1.1** General view, open area of Intensive Therapy Unit, Western Infirmary, Glasgow

The unit in which the author works at the Western Infirmary, Glasgow (WIG), is amongst the most recently built in the United Kingdom with a bed complement of 12, a number consistent with the view that a large general hospital should have 1 per cent of its beds designated for intensive care purposes (DHSS, 1970). Some take the view that this figure is likely to prove an underestimate in hospitals of the future. Six of the unit's 12 beds are in an open area (Fig. 1.1) which is well lit and has windows. One of the less laudable contributions of early ITU designers was to place them in basements, in the belief that most intensive care patients were unconscious and, therefore, unaware of their surroundings. On both counts they were wrong and furthermore, they did not appreciate the serious psychological implications for the staff, of routine isolation from a normal external environment (Vairub, 1972). Beside each bed, standard electronic equipment allows monitoring of the patient's vital functions, and some of this information is conveyed to a central display system close to the nurses' station. The remaining six beds in the unit are



**Fig. 1.2** Single cubicle for intermediate care

in individual cubicles (Fig. 1.2) which, amongst other advantages to be discussed later, reduces the risk of cross-infection, a major danger in patients whose host defence mechanisms are already seriously jeopardised. One of the cubicles, which can accommodate two beds, has been adapted for the performance of specialised techniques such as renal dialysis and shock resuscitation (Fig. 1.3).



**Fig. 1.3** Special Procedures Room

## PATIENTS

From the economic standpoint bed occupancy should be kept at a maximum but it is common experience that ITUs operate optimally at about 80 per cent occupancy. Even at

this level, if the patients are simultaneously at a dangerous stage of their illness, the mental and physical strain on the attendant staff can be considerable. A spectrum of severity of illness is preferable, and it pays dividends to allocate one or two beds within the unit for patients who are recovering from a protracted illness but who remain frail. Not only do staff thereby identify with their successes, which does wonders for morale, but premature discharge of such patients from an ITU can be lethal if the receiving ward is poorly staffed with experienced nurses.

Suitable selection of patients is of fundamental importance in an ITU. By and large, the facilities of an ITU should be offered only to those critically ill patients whose chances of survival in that unit are good and whose quality of survival is expected to be reasonable. None the less, mortality in most ITUs is considerably higher than in a general ward and the final degree of recovery in some patients is less than might have been desired. It is for these reasons that one of the important areas of current research is the development of more reliable determinants of prognosis in critically ill patients, both at the time of admission and during the course of early resuscitation. Many ITU patients, of course, become critically ill while in hospital, e.g. following surgery, and there is evidence that early assessment and categorisation of all patients on admission to hospital increases identification of those at special risk. In some centres, where such assessment systems are being evaluated, more efficient and economic use of expensive intensive therapy facilities has been shown to result. Even with the best possible process of selection, however, some patients will finally fail to respond to therapy. Discontinuation of life-support treatment is perhaps the most distasteful task which confronts an intensive therapy consultant, but very occasionally such action is required and there is much to be said for acting decisively when the patient's condition is known to have become irrecoverable. Both the patient and his relatives are spared a lingering death.

Analysis of data from the ITU at the WIG during the first five years of its existence (1968-1973) revealed that of 1000 admissions the mean age was 51 years, the mean duration of stay was five days and the overall mortality was 27 per cent (Ledingham, 1975a). Mortality figures are only of significance when related to the nature and severity of the illness requiring treatment. The small number of beds (five in total) available for intensive therapy at the WIG during the initial five years restricted admissions to the most gravely ill, i.e. those who would have died without specialised care. In spite of this, three of every four patients were discharged alive. Of the total number of patients, 31 per cent were referred with medical conditions, 33 per cent with surgical conditions and 16 per cent with major trauma. The mortality was well below average amongst patients with respiratory failure of medical or postoperative origin, whilst mortality amongst shocked patients was more than twice the average for the group as a whole.

## STAFFING AND TRAINING

Staffing of ITUs can present major administrative difficulties. In addition to the general problem of shortage of staff, there is the specific problem of a fluctuating patient load. ITUs serving a large population experience this problem less frequently than smaller units but the element of unpredictability is common to both. During quiet spells there is a great temptation to disperse ITU staff to other parts of the hospital but the result is often disruption of the team spirit so essential to the smooth-running of an ITU. Quiet spells may be more advantageously utilised for the various tasks which inevitably take second

place during busier periods, e.g. teaching, spring-cleaning, redecorating and bacteriological surveys.

The nursing problem is in some ways curious since one of the original reasons for bringing together critically ill patients in an ITU was to rationalise nursing care of these patients throughout a hospital. In fact, of course, the major demand in ITUs is for skilled, experienced nurses of whom few hospitals can claim a surfeit. It is clearly desirable to provide at all times one nurse for each critically ill patient. Allowing for holidays and sickness, this implies a staff/patient ratio of about four to one, on a continuous 24-h basis (Tinker, 1976). This ideal is rarely achieved and most ITUs are obliged to tolerate periods of extreme overactivity. One of the best methods of maintaining adequate recruitment of skilled nursing staff is by providing training courses. The syllabus of these courses varies from one centre to another but national standards of requirement are beginning to emerge. The duration of most courses is either six or twelve months.

The problem of medical staffing is not limited to the question of numbers. The method of medical staffing is also a controversial issue although the consensus of opinion is that intensive therapy should be multidisciplinary. Views differ as to how this end is best achieved. Some consider that the patient in an ITU should be cared for by his own doctor, calling as required on the help of the anaesthetist, respiratory physician, cardiologist and other specialists. An alternative system has worked well in the WIG for a number of years, i.e. a small group of five consultants from different disciplines with a definite sessional commitment to intensive therapy and working together as a team. However, an analysis carried out by the Intensive Care Society showed that neither of these alternatives is commonly practised in the United Kingdom, and that about 70 per cent of ITUs in this country were staffed exclusively by anaesthetists, working either alone or in groups.

Whatever method of medical staffing is adopted, the advantages of having full-time senior and junior medical staff are self-evident. Someone of considerable experience is immediately available to advise and participate in the care of patients whose clinical condition is subject to rapid change at any time of the day or night. Obviously the degree of personal involvement required by senior personnel will depend on the availability, training and experience of the junior staff but the patient load per se may require the presence of all available medical staff. Coordination of the multidisciplinary activities of an ITU is more efficient if handled by a single group of doctors whose efforts are not diluted by other commitments. All junior medical staff should spend part of their training period in the hospital general ITU. Pursuit of this policy at the WIG has disclosed a number of advantages. It encourages recognition of the ITU as an important hospital commitment and reduces the sense of isolation which otherwise may become a problem. It also encourages dissemination of knowledge about intensive care techniques and procedures, which has contributed over the years to a definite improvement in the care of acutely ill patients admitted to the general wards.

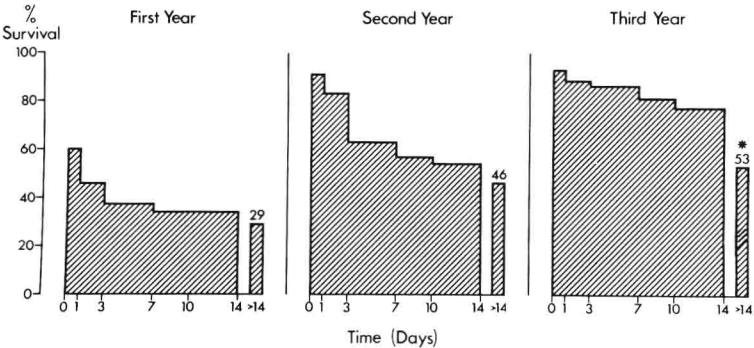
Apart from a very few countries, intensive care is not regarded as a specialty in its own right although the need for a formal training programme for aspiring intensive therapists is beginning to be felt, and outlines for such programmes have been proposed (SCCM, 1973; Chew and Hanson, 1976). Undoubtedly, the strongest arguments in favour of a specific training programme for intensive therapy are the variability of intensive care standards in most countries coupled with the fact that none of the training programmes offered by established specialties wholly meets the requirements for intensive therapy.

During the past few years the value of several groups of ancillary staff has become recognised. Physiotherapists with a particular interest in respiratory problems are indispensable in the day-to-day care of the critically ill patient, and technicians with specialised skills have accepted responsibility for the increasingly diverse range of equipment to be found in the modern ITU.

RESEARCH

One of the most significant justifications for having staff with a definite commitment to intensive therapy is the need to explore the causes of critical illness and to develop new methods of treatment. In this context the importance of a multidisciplinary approach is especially emphasised. Perhaps one of the biggest gaps in our knowledge of the precise role of intensive therapy in medical care concerns rehabilitation of patients who have suffered a severe, often protracted illness. Although there is a reasonable volume of data on acute mortality and morbidity, information from long-term follow-up of critically ill patients is urgently required and will necessitate the active collaboration of a number of groups, medical and paramedical.

There are many examples of the practical value of clinical research in the area of intensive care, several of which form the substance of subsequent chapters in this volume. Two examples of research which have had an immediate impact on patient care at the WIG concern studies of the high mortality amongst patients with the shock syndrome, and transport of the critically ill. The latter topic is discussed in more detail elsewhere in this volume. Perhaps one of the most encouraging aspects of the shock project was the speed with which the multidisciplinary shock team became integrated within the framework of the acute medical and surgical services (Ledingham et al, 1974). Clearly a gap in the existing services of the hospital had been filled. In the case of patients suffering from traumatic or haemorrhagic shock the value of the shock team appeared to lie in the fact that a small number of medical personnel became increasingly experienced in handling problems which had to be tackled immediately and rapidly. In the case of shock secondary to sepsis the role of the shock team was in providing intensive and sustained care of acutely ill patients, frequently over prolonged periods of time. Medical staffing in most ITUs does not permit such sustained effort without detracting from the care of other patients in the unit. The team's endeavours proved particularly successful in patients



**Fig. 1.4** Three-year prospective study (1971–1974) of the multidisciplinary shock team at the Western Infirmary, Glasgow, investigating septic shock



suffering from septic shock (Ledingham, 1975b). Long-term survival in these patients rose during a three-year period of study from 29 to 53 per cent (Fig. 1.4). During the third year the death of a number of patients after discharge from the ITU emphasises the point made earlier about the importance of intermediate care in these frail patients. The overall improvement in survival after septic shock appeared to be multifactorial in origin and included increased speed of action of the shock team, more active haemodynamic support, broader antibiotic cover, early intermittent positive pressure ventilation and aggressive surgery. Not only did survival increase but so also did survival times. Whereas during the first year the bulk of mortality occurred during the first 24 h after the onset of shock, during the third year only a very few patients failed to be acutely resuscitated. In the latter period the bulk of the mortality occurred after 14 days. The longer-term complications which arose during the second half of the study in septic shock patients included stress bleeding, super-added infection and multiple organ failure. During the past few months even these hitherto lethal complications have proved amenable to investigation and treatment.

## GENERAL SUMMARY

Much has been achieved during the past few years in respect of care of the critically ill. Most large hospitals have intensive care facilities and a general policy relating to referral of selected patients. Appropriate training courses are already established for nurses, and others are being developed for physiotherapists and technicians. In most countries medical training programmes are not well defined, a state of affairs which is generally regarded as unfortunate and seems to merit early attention. For the future, the research and development potential of ITUs should be more widely appreciated with emphasis on the value of a multidisciplinary approach to critical care investigation. The possibility of coordinating acute medical services should be given consideration accepting that the degree of integration in practice may vary from hospital to hospital and from region to region.

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