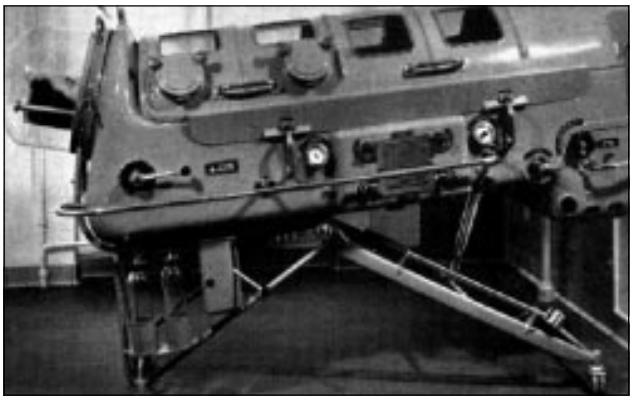
ABC of intensive care

Organisation of intensive care

David Bennett, Julian Bion

Intensive care dates from the polio epidemic in Copenhagen in 1952. Doctors reduced the 90% mortality in patients receiving respiratory support with the cuirass ventilator to 40% by a combination of manual positive pressure ventilation provided through a tracheostomy by medical students and by caring for patients in a specific area of the hospital instead of across different wards. Having an attendant continuously at the bedside improved the quality of care but increased the costs and, in some cases, death was merely delayed.

These findings are still relevant to intensive care today, even though it has expanded enormously so that almost every hospital will have some form of intensive care unit. Many questions still remain unanswered regarding the relation between costs and quality of intensive care, the size and location of intensive care units, the number of nursing and medical staff and intensive care beds required, and how to direct scarce resources towards those most likely to benefit.



The origins of intensive care can be traced to the 1952 polio epidemic in Copenhagen

Patients

Intensive care beds are occupied by patients with a wide range of clinical conditions but all have dysfunction or failure of one or more organs, particularly respiratory and cardiovascular systems. Patients usually require intensive monitoring, and most need some form of mechanical or pharmacological support such as mechanical ventilation, renal replacement therapy, or vasoactive drugs. As patients are admitted from every department in the hospital, staff in intensive care need to have a broad range of clinical experience and a holistic approach to patient care.

The length of patient stay varies widely. Most patients are discharged within 1-2 days, commonly after postoperative respiratory and cardiovascular support and monitoring. Some patients, however, may require support for several weeks or months. These patients often have multiple organ dysfunction. Overall mortality in intensive care is 20-30%, with a further 10% dying on the ward after discharge from intensive care.

"Experimental" intensive care ward, St George's Hospital, 1967

Provision

Intensive care comprises 1-2% of total bed numbers in the United Kingdom; this compares with proportions as high as 20% in the United States. Patients admitted in Britain therefore tend be more severely ill than those in America. The average intensive care unit in Britain has four to six beds, although units in larger hospitals, especially those receiving tertiary referrals, are bigger. Few units have more than 15 beds. Throughput varies from below 200 to over 1500 patients a year. In addition to general intensive care units, specialty beds are provided for cardiothoracic, neurosurgical, paediatric, and neonatal patients in regional centres.

The frequent shortages of intensive care beds and recent expansion of high dependency units have led to renewed efforts to define criteria for admission and discharge and standards of service provision. Strict categorisation is difficult; an agitated, confused but otherwise stable patient often requires at least as much attention as a sedated, mechanically ventilated patient. Furthermore, underresourced hospitals may have to refuse admission to those who would otherwise be admitted. A recent

Modern intensive care usually includes comprehensive monitoring and organ support. Pressure on resources is high

study sponsored by the Department of Health suggested that patients refused intensive care have a higher mortality than similar patients who do get admitted.

Transfer to another hospital is generally reserved for those patients requiring mechanical ventilation, renal support, or specialist treatment not available in the referring hospital. Transfer of such critically ill patients is not undertaken lightly. It is labour intensive and should be performed by experienced staff with specialised equipment. In addition, such transfers remove staff from the referring hospital, often at times when they are in short supply.

Staffing

Medical

Each intensive care unit has several consultants (ranging from two to seven) with responsibility for clinical care, one of whom will be the clinical director. There are few full time intensivists in the United Kingdom. Most consultants will have anaesthetic or medical sessions in addition to their intensive care commitments. The consultants provide 24 hour non-resident cover.

In general, junior doctor staffing levels are lower in Britain than elsewhere in Europe. Most junior doctors are either anaesthetic senior house officers or specialist registrars, who may provide dedicated cover to the intensive care unit or have duties in other clinical areas such as obstetrics and emergency theatre. Increasingly, posts are being incorporated into medical or surgical rotations. Larger units often also have a more senior registrar on a longer attachment. These are training posts for those intending to become fully accredited intensivists. Such training schemes are a relatively recent innovation in Britain.

The medical staff will typically perform a morning ward round and a less formal round in the afternoon. The on call team does a further round in the evening.

Nursing

The general policy in the United Kingdom is to allocate one nurse to each intensive care patient at all times with two or three shifts a day. One nurse may care for two less sick patients, and occasionally a particularly sick patient may require two nurses. This nurse:patient ratio requires up to seven established nursing posts for each bed and an average of 30-50 nurses per unit. Elsewhere in Europe the nurse:patient ratio is usually 1:2 or 1:3, although the units are larger and have a higher proportion of low risk patients. Many intensive care nurses will have completed a specialist training programme and have extensive experience and expertise. Not surprisingly, nursing salaries comprise the largest component of the intensive care budget. However, a shortage exists of appropriately qualified staff, which leads to refused admissions, cancellation of major elective operations, and a heavy and stressful workload for the existing nurses. To ease this problem, healthcare assistants are being increasingly used to undertake some of the more mundane tasks.

Audit

Intensive care audit is highly sophisticated and detailed. Dedicated staff are often required to assist with data collection which includes information on diagnoses, demographics, severity, resource use, and outcome. Methods such as severity scoring are being developed to adjust for case mix to enable comparisons within and between units. The establishment of the Intensive Care National Audit Research Centre (ICNARC) and Scottish Intensive Care Society Audit Group has been an

Mechanical ventilator, 1969

Mechanical ventilator, 1999

Role of other health careprofessionals in intensive care

Professional	Role
Physiotherapists	Prevent and treat chest problems, assist mobilisation, and prevent contractures in immobilised patients
Pharmacists	Advise on potential drug interactions and side effects, and drug dosing in patients with liver or renal dysfunction
Dietitians	Advise on nutritional requirements and feeds
Microbiologists	Advise on treatment and infection control
Medical physics technicians	Maintain equipment, including patient monitors, ventilators, haemofiltration machines, and blood gas analysers

Effective audit is essential for evaluating treatments in intensive care

important step in this respect. ICNARC has recently developed a national case mix programme, to which many UK intensive care units subscribe.

Cost

Intensive care is expensive. The cost per bed day is £1000-£1800 with salaries accounting for over 60%, pharmacy for 10%, and disposables for a further 10%. The current contracting process has found it difficult to account for intensive care, partly because it does not have multidisciplinary specialty status and is therefore extremely difficult to isolate from the structure of the "finished consultant episode." This has been partially resolved by the development of the augmented care period (except in Scotland), defined by 12 data items which include information about the duration and intensity of care. It is intended that this will become part of hospital administration systems and improve the process of contracting for intensive care services. This is essential for budgetary health and the development of intensive care as an independent multidisciplinary specialty. In the United Kingdom, in parallel with many other countries, specialty status is in the process of being officially accorded.

The intensive care budget often falls within a directorate such as anaesthesia or theatres, although large units may have a separate budget. Units now have a business manager, who may be employed specifically for this role or, more commonly, be a senior nurse. This is a daunting task. Severe constraints are often rigorously applied by the hospital management leading to bed closures and an inability to replace ageing equipment.

Caring for relatives and patients

The intensive care environment can be extremely distressing for both relatives and conscious patients. The high mortality and morbidity of patients requires considerable psychological and emotional support. This is provided by the medical and nursing staff often in conjunction with chaplains and professional and lay counsellors. Such support is difficult and time consuming and requires the involvement of senior staff.

Many relatives and close friends wish to be close to critically ill patients at all times. Visiting times are usually flexible and many units have a dedicated visitors' sitting room with basic amenities such as a kitchenette, television, and toilet facilities. On site overnight accommodation can often be provided.

Summary

Few large scale studies exist of intensive care. This is partly because the patient population is heterogeneous and difficult to investigate. Although clinical management varies according to local need and facilities and the views of medical and nursing staff, similar philosophies are generally adopted.

Underprovision of intensive care is likely to dominate policy decisions in the near future. Intensive care will probably have an increasingly important role as the general population ages and the expectation for health care and the complexity of surgery increases.

The picture of the patient with polio was provided by *Danske Fysioterpeuter* (Danish journal of physiotherapy). We thank Radiometer UK and St George's Hospital archivist for help.

BMJ 1999;318:1468-70

Blood gas analysers, 1964 and 1999: technological developments have improved patient care but added to the cost

Key points

- Organisation of intensive care units in the United Kingdom varies widely
- Clinical managements strategies are determined by local need, facilities, and staff
- Lack of large scale studies has hampered consensus on treatment
- Underprovision of intensive care is likely to dominate policy decisions in near future

David Bennett is professor of intensive care medicine, St George's Hospital Medical School, London and Julian Bion is reader in intensive care medicine, Queen Elizabeth Medical Centre, Birmingham

The ABC of intensive care is edited by Mervyn Singer, reader in intensive care medicine, Bloomsbury Institute of Intensive Care Medicine, University College London and Ian Grant, director of intensive care, Western General Hospital, Edinburgh. The series was conceived and planned by the Intensive Care Society's council and research subcommittee.