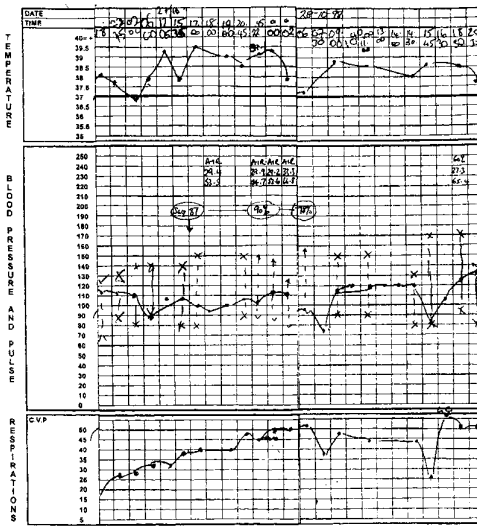
ABC of intensive care
Criteria for admission

Gary Smith, Mick Nielsen

Intensive care has been defined as "a service for patients with potentially recoverable conditions who can benefit from more detailed observation and invasive treatment than can safely be provided in general wards or high dependency areas." It is usually reserved for patients with potential or established organ failure. The most commonly supported organ is the lung, but facilities should also exist for the diagnosis, prevention, and treatment of other organ dysfunction.

Who to admit

Intensive care is appropriate for patients requiring or likely to require advanced respiratory support, patients requiring support of two or more organ systems, and patients with chronic impairment of one or more organ systems who also require support for an acute reversible failure of another organ. Early referral is particularly important. If referral is delayed until the patient's life is clearly at risk, the chances of full recovery are jeopardised.



Ward observation chart showing serious physiological deterioration

Categories of organ system monitoring and support

(Adapted from *Guidelines on admission to and discharge from intensive care and high dependency units.* London: Department of Health, 1996.)

Advanced respiratory support
- Mechanical ventilatory support (excluding mask continuous positive airway pressure (CPAP) or non-invasive (eg, mask) ventilation)
- Possibility of a sudden, precipitous deterioration in respiratory function requiring immediate endotracheal intubation and mechanical ventilation

Basic respiratory monitoring and support
- Need for more than 50% oxygen
- Possibility of progressive deterioration to needing advanced respiratory support
- Need for physiotherapy to clear secretions at least two hourly
- Patients recently extubated after prolonged intubation and mechanical ventilation
- Need for mask continuous positive airway pressure or non-invasive ventilation
- Patients who are intubated to protect the airway but require no ventilatory support and who are otherwise stable

Circulatory support
- Need for vasoactive drugs to support arterial pressure or cardiac output
- Support for circulatory instability due to hypovolaemia from any cause which is unresponsive to modest volume replacement (including post-surgical or gastrointestinal haemorrhage or haemorrhage related to a coagulopathy)
- Patients resuscitated after cardiac arrest where intensive or high dependency care is considered clinically appropriate
- Intra-aortic balloon pumping

Neurological monitoring and support
- Central nervous system depression, from whatever cause, sufficient to prejudice the airway and protective reflexes
- Invasive neurological monitoring

Renal support
- Need for acute renal replacement therapy (haemodialysis, haemofiltration, or haemodiafiltration)

As with any other treatment, the decision to admit a patient to an intensive care unit should be based on the concept of potential benefit. Patients who are too well to benefit or those with no hope of recovering to an acceptable quality of life should not be admitted. Age by itself should not be a barrier to admission to intensive care, but doctors should recognise that increasing age is associated with diminishing physiological reserve and an increasing chance of serious coexisting disease. It is important to respect patient autonomy, and patients should not be admitted to intensive care if they have a stated or written desire not to receive intensive care—for example, in an advanced directive.

Severity of illness scoring systems such as the acute physiology and chronic health evaluation (APACHE) and simplified acute physiology score (SAPS) estimate hospital mortality for groups of patients. They cannot be used to predict which patients will benefit from intensive care as they are not sufficiently accurate and have not been validated for use before admission.

Factors to be considered when assessing suitability for admission to intensive care
- Diagnosis
- Severity of illness
- Age
- Coexisting disease
- Physiological reserve
- Prognosis
- Availability of suitable treatment
- Response to treatment to date
- Recent cardiopulmonary arrest
- Anticipated quality of life
- The patient's wishes

When to admit

Patients should be admitted to intensive care before their condition reaches a point from which recovery is impossible. Clear criteria may help to identify those at risk and to trigger a call for help from intensive care staff. Early referral improves the chances of recovery, reduces the potential for organ dysfunction (both extent and number), may reduce length of stay in intensive care and hospital, and may reduce the costs of intensive care. Patients should be referred by the most senior member of staff responsible for the patient—that is, a consultant. The decision should be delegated to trainee doctors only if clear guidelines exist on admission. Once patients are stabilised they should be transferred to the intensive care unit by experienced intensive care staff with appropriate transfer equipment.

Criteria for calling intensive care staff to adult patients
(Adapted from McQuillan et al *BMJ* 1998;316:1853-8.)

- Threatened airway
- All respiratory arrests
- Respiratory rate ≥40 or ≤8 breaths/min
- Oxygen saturation <90% on ≥50% oxygen
- All cardiac arrests
- Pulse rate <40 or >140 beats/min
- Systolic blood pressure <90 mm Hg
- Sudden fall in level of consciousness (fall in Glasgow coma score >2 points)
- Repeated or prolonged seizures
- Rising arterial carbon dioxide tension with respiratory acidosis
- Any patient giving cause for concern

Initial treatment

In critical illness the need to support the patient's vital functions may, at least initially, take priority over establishing a precise diagnosis. For example, patients with life threatening shock need immediate treatment rather than diagnosis of the cause as the principles of management are the same whether shock results from a massive myocardial infarction or a gastrointestinal bleed. Similarly, although the actual management may differ, the principles of treating other life threatening organ failures—for example, respiratory failure or coma—do not depend on precise diagnosis.

Basic monitoring requirements for seriously ill patients

- Heart rate
- Blood pressure
- Respiratory rate
- Pulse oximetry
- Hourly urine output
- Temperature
- Blood gases

Respiratory support

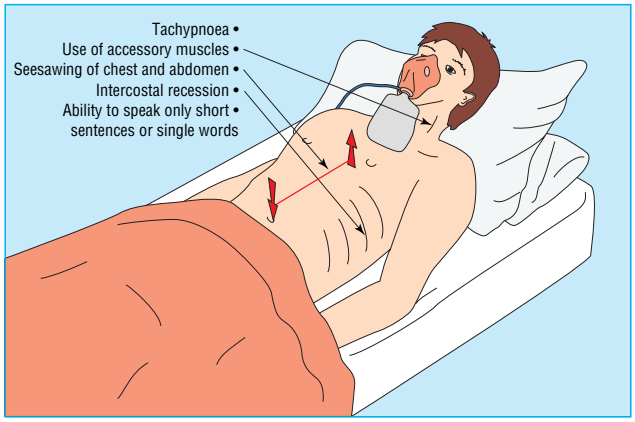
All seriously ill patients without pre-existing lung disease should receive supplementary oxygen at sufficient concentration to maintain arterial oxygen tension ≥8 kPa or oxygen saturation of at least 90%. In patients with depressed ventilation (type II respiratory failure) oxygen will correct the hypoxaemia but not the hypercapnia. Care is required when monitoring such patients by pulse oximetry as it does not detect hypercapnia.

A few patients with severe chronic lung disease are dependent on hypoxic respiratory drive, and oxygen may depress ventilation. Nevertheless, life threatening hypoxaemia must be avoided, and if this requires concentrations of oxygen that exacerbate hypercapnia the patient will probably need mechanical ventilation.

Any patient who requires an inspired oxygen concentration of 50% or more should ideally be managed at least on a high dependency unit. Referral to intensive care should not be based solely on the need for endotracheal intubation or mechanical ventilation as early and aggressive intervention, high intensity nursing, and careful monitoring may prevent further deterioration. Endotracheal intubation can maintain a patent airway and protect it from contamination by foreign material such as regurgitated or vomited gastric contents or blood. Putting the patient in the recovery position with the head down helps protect the airway while awaiting the necessary expertise for intubation. Similarly, simple adjuncts such as an oropharyngeal airway may help to maintain airway patency, although it does not give the protection of an endotracheal tube.

Breathlessness and respiratory difficulty are common in acutely ill patients. Most will not need mechanical ventilation, but those that do require ventilation need to be identified as early as possible and certainly before they deteriorate to the point of respiratory arrest. The results of blood gas analysis alone are rarely sufficient to determine the need for mechanical ventilation. Several other factors have to be taken into consideration:

Pulse oximeters give no information about presence or absence of hypercapnia



Signs of excessive respiratory work

Degree of respiratory work—A patient with normal blood gas tensions who is working to the point of exhaustion is more likely to need ventilating than one with abnormal tensions who is alert, oriented, talking in full sentences, and not working excessively.

Likely normal blood gas tensions for that patient—Some patients with severe chronic lung disease will lead surprisingly normal lives with blood gas tensions which would suggest the need for ventilation in someone previously fit.

Likely course of disease—If imminent improvement is likely ventilation can be deferred, although such patients need close observation and frequent blood gas analysis.

Adequacy of circulation—A patient with established or threatened circulatory failure as well as respiratory failure should be ventilated early in order to gain control of at least one major determinant of tissue oxygen delivery.

Circulatory support

Shock represents a failure of tissue perfusion. As such, it is primarily a failure of blood flow and not blood pressure. Nevertheless, an adequate arterial pressure is essential for perfusion of major organs and glomerular filtration, particularly in elderly or hypertensive patients, and for sustaining flow through any areas of critical narrowing in the coronary and cerebral vessels. A normal blood pressure does not exclude shock since pressure may be maintained at the expense of flow by vasoconstriction. Conversely, a high cardiac output (for example, in sepsis) does not preclude regional hypoperfusion associated with systemic vasodilatation, hypotension, and maldistribution.

Shock may be caused by hypovolaemia (relative or actual), myocardial dysfunction, microcirculatory abnormalities, or a combination of these factors. To identify shock it is important to recognise the signs of failing tissue perfusion.

All shocked patients should receive supplementary oxygen. Thereafter, the principles of management are to ensure an adequate circulating volume and then, if necessary, to give vasoactive drugs (for example, inotropes, vasopressors, vasodilators) to optimise cardiac output (and hence tissue oxygen delivery) and correct hypotension. Most patients will need intravenous fluid whatever the underlying disease. Central venous pressure may guide volume replacement and should be considered in patients who fail to improve despite an initial litre of intravenous fluid or sooner in patients with known or suspected myocardial dysfunction. Any patients needing more than modest fluid replacement or who require vasoactive drugs to support arterial pressure or cardiac output should be referred for high dependency or intensive care.

Neurological support

Neurological failure may occur after head injury, poisoning, cerebral vascular accident, infections of the nervous system (meningitis or encephalitis), cardiac arrest, or as a feature of metabolic encephalopathy (such as liver failure). The sequelae of neurological impairment may lead to the patient requiring intensive care. For instance, loss of consciousness may lead to obstruction of airways, loss of protective airway reflexes, and disordered ventilation that requires intubation or tracheostomy and mechanical ventilation.

Neurological disease may also cause prolonged or recurrent seizures or a rise in intracranial pressure. Patients who need potent anaesthetic drugs such as thiopentone or propofol to treat seizures that are resistant to conventional anticonvulsants, or monitoring of intracranial pressure and cerebral perfusion pressure must be referred to a high dependency or intensive care unit. Patients with neuromuscular disease (for example,

Peripheral cyanosis and poor capillary refill indicate failing circulation

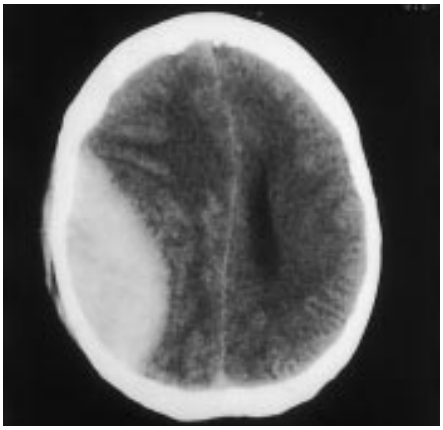
Signs suggestive of failing tissue perfusion

- Tachycardia
- Confusion or diminished conscious level
- Poor peripheral perfusion (cool, cyanosed extremities, poor capillary refill, poor peripheral pulses)
- Poor urine output (< 0.5 ml/kg/h)
- Metabolic acidosis
- Increased blood lactate concentration

Normal blood pressure does not exclude shock

Neurological considerations in referral to intensive care

- Airway obstruction
- Absent gag or cough reflex
- Measurement of intracranial pressure and cerebral perfusion pressure
- Raised intracranial pressure requiring treatment
- Prolonged or recurrent seizures which are resistant to conventional anticonvulsants
- Hypoxaemia
- Hypercapnia or hypocapnia



Extradural haematoma

Guillain-Barré syndrome, myasthenia gravis) may require admission to intensive care for intubation or ventilation because of respiratory failure, loss of airway reflexes, or aspiration.

Renal support

Renal failure is a common complication of acute illness or trauma and the need for renal replacement therapy (haemofiltration, haemodialysis, or their variants) may be a factor when considering referral to intensive or high dependency care. The need for renal replacement therapy is determined by assessment of urine volume, fluid balance, renal concentrating power (for example, urine:plasma osmolality ratio and urinary sodium concentration), acid-base balance, and the rate of rise of plasma urea, creatinine, and potassium concentrations. In ill patients hourly recording of urine output on the ward may give an early indication of a developing renal problem; prompt treatment, including aggressive circulatory resuscitation, may prevent this from progressing to established renal failure.

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The ABC of intensive care is edited by Mervyn Singer, reader in intensicve 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.

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Measurement of urine output is important to detect renal problems promptly

Indications for considering renal replacement therapy

- Oliguria (< 0.5ml/kg/h)
- Life threatening hyperkalaemia (> 6 mmol/l) resistant to drug treatment
- Rising plasma concentrations of urea or creatinine, or both
- Severe metabolic acidosis
- Symptoms related to uraemia (for example, pericarditis, encephalopathy)

A memorable patient

What a rotten job you've got

He was a large man with gynaecomastia and he was covered in bruises. The day before his general practitioner had sent him up to hospital for a full blood count. The phlebotomist he saw had taken enough blood for a clotting screen and this had revealed disseminated intravascular coagulation. He had been admitted urgently to the ward on which I was house officer. There my efforts to obtain more blood were failing as each vein I tried ballooned and bled into his skin. I sweated, he contained his irritation, and finally there were a few more millilitres.

With some relief I stood near the door, talking in general terms about further tests. "What do you think's the cause of this blood not clotting then?" he asked. He had been diagnosed 17 years before with prostatic cancer and had taken stilboestrol long term, but I did not know what, if anything, he had been told about the implications of this new development. His directness caught me off guard. "I don't know. Sometimes it can be, er, an after effect of the, er, prostate." He frowned, looking as if he were trying to make sense of me. I made a polite escape.

The next day I apologised to my consultant for the small blood sample. "Don't worry," she said as we walked to the patient's room, "his bone marrow is stuffed with malignancy. There's nothing we can do. He could bleed suddenly or last several weeks. I'm going to tell him now." She sat down to tell him that he was dying and I busied myself on the ward.

Afterwards, a ward nurse, wincing in the direction of his room, asked me to write up some pain control for him. Hesitating, I went into his room to fetch his drug chart. "I'll not stay if you don't want me to," I said. "No stay," he said gratefully, "I'd like to talk. I've been waiting 17 years for this, and I sort of knew when you said last night. I knew what you wanted to do—to let me down gently—I sort of knew anyway. He turned away, and looking out of the window he added, "God. What a rotten job you've got." I stared at him as he looked out into the watery sunlight of that winter day. I had no idea what I had been trying to do and I wondered at his equanimity. He turned back, "It's my wife I worry about. I just don't know how she's going to react. She could go to pieces and she's losing her job soon. I feel uneasy about going home too. Of course there are these new places—hospices—that might be a thing to consider." There he faltered.

Within those few minutes he had taken on board his diagnosis, his prognosis, and had begun thinking in practical terms. I realised then that I was out of my depth and that my training had not prepared me to know what to do. After he died I rather dutifully took some books out of the library on communication with the dying, but as a house officer I did not have time to read them. It was only later interviewing patients with cancer for research that my thoughts turned back to the clear sightedness of this man. He showed me that some patients can face more than we can as doctors and see the truth before us. They can also feel sympathy for us as we struggle behind.

Elizabeth Davies, *research fellow, London*

We welcome articles of up to 600 words on topics such as *A memorable patient, A paper that changed my practice, My most unfortunate mistake,* or any other piece conveying instruction, pathos, or humour. If possible the article should be supplied on a disk. Permission is needed from the patient or a relative if an identifiable patient is referred to. We also welcome contributions for "Endpieces," consisting of quotations of up to 80 words (but most are considerably shorter) from any source, ancient or modern, which have appealed to the reader.