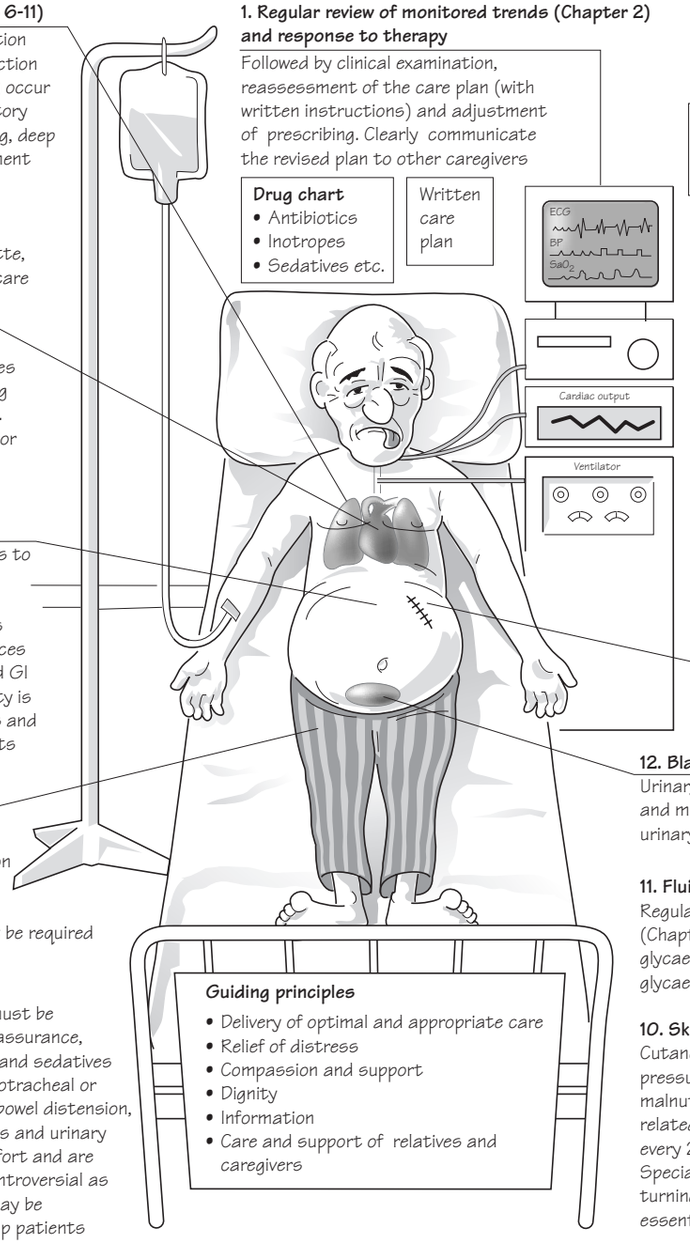
1 Management of the critically ill patient



2. Respiratory care (Chapters 6-11)
Altered ventilation, poor secretion clearance, impaired muscle function and lung collapse (atelectasis) occur in the supine position. Respiratory care includes assisted coughing, deep breathing and alveolar recruitment techniques (e.g. CPAP), chest percussion, postural drainage, positioning (e.g. sitting up), bronchodilators, tracheal toilette, suctioning and tracheostomy care

3. Cardiovascular care
Prolonged immobility impairs autonomic vasomotor responses to sitting and standing causing profound postural hypotension. Tilt tables may be beneficial prior to mobilization

4. Gastrointestinal (GI)/nutritional care
The supine position predisposes to gastro-oesophageal reflux and aspiration pneumonia. Nursing patients 30° head-up prevents this. Early enteral feeding reduces infection, stress ulceration and GI bleeding (Chapter 14). Immobility is associated with gastric stasis and constipation; gastric stimulants and laxatives are essential

5. Neuromuscular
Immobility, prolonged neuromuscular blockade and sedation promote muscle atrophy, joint contractures and foot drop. Physiotherapy and splints may be required

6. Comfort and reassurance
Anxiety, discomfort and pain must be recognized and relieved with reassurance, physical measures, analgesics and sedatives (Chapter 13). In particular, endotracheal or nasogastric tubes, bladder or bowel distension, inflamed line sites, painful joints and urinary catheters often cause discomfort and are often overlooked. Fan use is controversial as dust-borne micro-organisms may be disseminated. Visible clocks help patients maintain circadian rhythms (i.e. day-night patterns)

7. Communication with the patient
Use of amnesic drugs makes repeated explanations and reassurance essential. Assist interaction with appropriate communication aids

8. Venous thrombosis prophylaxis
Trauma, sepsis, surgery and immobility predispose to lower limb thrombosis. Mechanical and pharmacological prophylaxis prevent potentially life-threatening pulmonary embolism (Chapter 27)

1. Regular review of monitored trends (Chapter 2) and response to therapy
Followed by clinical examination, reassessment of the care plan (with written instructions) and adjustment of prescribing. Clearly communicate the revised plan to other caregivers

Drug chart
- Antibiotics
- Inotropes
- Sedatives etc.

Written care plan

15. Visiting hours
Opinions differ with regard to relatives visiting hours. Some units restrict visits (e.g. 2 periods/day), others have almost unrestricted hours

14. Communication with relatives
Family members receive information from many caregivers with different perspectives and knowledge. Critical care teams must aim to be consistent in their assessments and honest about uncertainties. One or two physicians should act as primary contacts. All conversations must be documented. Compassionate care of relatives is always appreciated, avoids anger and is one of the best indicators of a well-functioning unit

13. Dressing and wound care
Replace wound dressings as necessary. Change arterial and central venous catheter dressings every 48-72 h

12. Bladder care
Urinary catheters cause painful urethral ulcers and must be stabilized. Early removal reduces urinary tract infections

11. Fluid, electrolyte and glucose balance
Regularly assess fluid and electrolyte balance (Chapter 5). Insulin resistance and hyperglycaemia are common but maintaining normoglycaemia improves outcome (Chapter 32)

10. Skin care, general hygiene and mouthcare
Cutaneous pressure sores are due to local pressure (e.g. bony prominences), friction, malnutrition, oedema, ischaemia and damage related to moist or soiled skin. Turn patients every 2 h and protect susceptible areas. Special beds relieve pressure and assist turning. Mouthcare and general hygiene are essential

Guiding principles
- Delivery of optimal and appropriate care
- Relief of distress
- Compassion and support
- Dignity
- Information
- Care and support of relatives and caregivers

9. Infection control
HAND WASHING is vital to prevent transmission of organisms between patients.
DISPOSABLE APRONS are recommended.
STERILE TECHNIQUE (e.g. gloves, masks, gowns, sterile field) is essential for all invasive procedures (e.g. line insertion).
ISOLATION (± negative pressure ventilation) for transmissible infections (e.g. tuberculosis).
THOROUGH CLEANING OF BED SPACES (e.g. routinely and after patient discharge)

In the critically ill patient, assessment of deranged physiology and immediate resuscitation must precede diagnostic considerations. At admission, classification by specialty according to primary organ dysfuction is rarely possible because the history is incomplete, examination inconclusive and diagnosis inadequate. It is this initial diagnostic uncertainty and the need for immediate monitoring and physiological support that defines critical care medicine.

Organization

Critical care medicine (CCM) provides a level of monitoring and treatment to patients with potentially reversible, life-threatening conditions that is not available on general wards. Patients should be managed and moved between areas where staffing and technical support match their severity of illness and clinical needs. Five types of ward area are described: intensive care units (ICUs; level 3); intermediate or high dependency units (HDUs; level 2); admission wards (level 1); general wards; and minimal (or self-care) wards. The principles and practice of CCM encompass ward levels 1–3. Level 3 patients usually require mechanical ventilation or have multiorgan failure. Levels 2 (i.e. medical/surgical HDU, postoperative recovery areas, emergency rooms) and 1 (i.e. acute admission wards, coronary care units) overlap considerably. They provide a high degree of monitoring and support, with level 2 often able to provide non-invasive ventilation or renal replacement therapy. Critical care provision varies from ~2% of hospital beds in the UK to >5–10% in the USA.

Admission and discharge guidelines

These facilitate appropriate use of resources and prevent unnecessary suffering in patients who have no prospect of recovery. Factors determining admission include the primary diagnosis, severity, likely success of treatment, comorbid illness, life expectancy, potential quality of life postdischarge and patient's (relatives') wishes. Age alone should not be a contraindication to admission and every case must be judged on its merit. If there is uncertainty, the patient should be given the benefit of the doubt and active treatment continued until further information is available. Appropriate discharge occurs when patients are physiologically stable and independent of monitoring and support. Out-of-hours and weekend discharges should be avoided, and a detailed handover is essential. In patients with no realistic hope of recovery, and after family consultation, withdrawal of therapy may be considered and organ donation tactfully discussed. Management must always remain positive to ensure death with dignity (Chapter 17).

General supportive care

General supportive care requires a multiskilled team of doctors, nurses, physiotherapists, technicians and other caregivers. The Figure illustrates important aspects of general management in critically ill patients. Prolonged bed rest predisposes to respiratory, cardiovascular (e.g. autonomic failure), neurological (e.g. muscle wasting) and endocrine (e.g. glucose intolerance) problems, fluid and electrolyte imbalance, constipation, infection, venous thrombosis and pressure sores.

Nursing care

The importance of skilled nursing in the management of critically ill patients cannot be overemphasized. Assessment, continuous monitoring, drug administration, comfort (e.g. analgesia, toilette), psychological support, assistance with communication, advocacy, skin care, positioning, feeding, and early detection of complications (e.g. line infection) are vital nursing roles which have a profound effect on outcome. Nurses also provide essential support for relatives, doctors, physiotherapists and other caregivers (e.g. technicians).

Scoring systems

Scoring systems (SS) are used to predict outcome and evaluate care. Two SS have been validated and are widely used in ICUs.

1 APACHE II (acute physiology and chronic health evaluation) aims to measure case-mix and predict outcome in ICU patients *as a group*. It should not be used to predict individual outcome. Scoring is based on the primary disease process, physiological reserve, including age and chronic health history (e.g. chronic liver, cardiovascular, respiratory, renal and immune conditions), and the severity of illness determined from the worst value in the first 24 h of 12 acute physiological variables, including rectal temperature, mean blood pressure (BP), heart rate, respiratory rate (RR), arterial P_aO_2 and pH, serum sodium, potassium and creatinine, haematoocrit, white cell count (WCC) and Glasgow Coma Score (GCS; Chapter 45). Predicted mortality, by diagnosis, has been calculated from large databases, which allows individual units to evaluate their performance against reference ICUs by calculating the standard mortality ratio (SMR = observed mortality ÷ predicted mortality) for each diagnostic group. A high SMR (>1.5) should prompt investigation and management changes for specific conditions.

2 SAPS (simplified acute physiology score) is similar to APACHE II with equivalent accuracy.

Pathology-specific SS are frequently used in CCM.

- **Trauma score (TS)** assesses triage status based on RR, respiratory effort, systolic BP, capillary refill and GCS. A high score indicates the need for transfer to a trauma centre. **Revised TS** uses only GCS, RR and systolic BP with improved prognostic reliability but less suitability for triage.
- **Abbreviated injury scale** assesses multiple injuries and correlates with morbidity and mortality.
- **Other SS** include the paediatric trauma score, neonatal Apgar score and GCS (Chapter 45).

Costs of CCM

Measuring ICU costs is complex. The most widely used system is the **Therapeutic Intervention Scoring System** (TISS), which scores the overall requirements for care by measuring nursing activity and interventions. TISS correlates well with staff, equipment and drug costs and can also be used as an index of nurse dependency. The majority (>50%) of ICU expenditure is on labour costs, in particular constant bedside nursing. Drugs, imaging, laboratory tests and supplies account for ~40% of spending. Consequently, cost saving usually requires personnel reductions, and risks lowering quality of care. Current estimates of daily ('basic') ICU costs vary from £800 to £1600 in the UK. HDU costs are ~50% and general ward care ~20% of ICU costs. In the USA, ~13% of gross domestic product (GDP) is spent on healthcare, with critical care costs ~7% of total expenditure. In comparison, the UK spends ~7–8% of GDP on healthcare with ~1% of total expenditure directed to critical care provision.