The critically ill patient: identification and initial stabilization

Introduction

The management of emergency medical admissions and critically ill patients has undergone considerable scrutiny in recent years. In an inquiry into quality of care before admission to the intensive care unit, the National Confidential Enquiry into Patient Outcome and Death identified the prime causes of substandard care of the acutely unwell patient in hospital as being delayed recognition and institution of inappropriate therapy ultimately culminating in late referral (Cullinane et al, 2005). This report found that, on a number of occasions, these factors were compounded by poor communication between the acute and critical care medical teams.

This article outlines how to recognize the sick patient, basic measures for junior doctors to undertake in their immediate management and useful investigations that will aid the critical care team in deciding on the need for transfer to a high dependency or an intensive care setting.

Recognizing the sick patient

The early identification of a patient at risk is important for a multitude of reasons: it permits early consideration and discussion of suitability for resuscitation and intensive care unit admission and, more importantly, allows timely intervention to prevent physiological deterioration alongside planning of intensive care unit admissions and resources. Numerous studies have confirmed deterioration of a patient's vital signs 6–12 hours before cardiac arrest or intensive care unit referral, the most commonly disturbed parameters being respiratory rate and altered conscious state. A respiratory rate >25/min is the most common finding before intensive care unit admission (Goldhill et al, 1999).

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Physiological track and trigger warning systems are widely used within acute hospitals. Nursing staff are trained to take physiological observations and have a predetermined calling or response criteria (trigger) to request medical assessment. Thus, track and trigger systems can be used to identify patients on general wards at risk of clinical deterioration (Goldhill and McNarry, 2004). Their main function is to ensure recognition of all patients with potential or established critical illness, to enable timely review by appropriately skilled staff (Gao et al, 2007).

Studies demonstrate that even when deterioration is correctly documented, there are failures to notify the appropriate personnel, or of trainees to respond, to correctly interpret the clinical scenarios (particularly in relation to blood gas analysis) or to resuscitate patients before transfer to intensive care unit (Franklin and Matthew, 1994).

It is useful to follow a basic structure when reviewing critically ill patients. The following approach outlines the key elements to determine in a patient which indicate the need for critical care team assessment, alongside appropriate immediate ward-based interventions. The guiding principle is to maintain oxygen delivery to the critical tissues (*Table 1*).

A and B: airway, breathing and oxygen therapy

The first priority is to ensure airway patency and to administer appropriate oxygen therapy. Asking the patient a simple question is a good start: a normal verbal response implies that the patient has a clear airway, is breathing and has adequate cerebral perfusion. Failure to respond is an indicator of serious illness. An inappropriate response may mean that the patient is confused and should prompt assessment for reversible medical causes.

Table 1. Normal physiological parameters

Temperature	36.0–37.4°C
Heart rate	50–99 beats/min
Systolic blood pressure	100–179 mmHg
Respiratory rate	10–19 breaths/min
Oxygen saturations (SpO2)	>95%
Urine output	0.5–3 ml/hour

The pattern of breathing and added breath sounds are of vital importance and may indicate the need for relatively simple airway support (such as a chin lift and jaw thrust), or more complex interventions (such as tracheal intubation or chest drain insertion). Gurgling breath sounds often indicate vomit or upper airway secretions, which should be cleared by gentle suctioning under direct vision. Paradoxical breathing pattern (see-saw movement of chest and abdomen), snoring or stridor may be signs of advanced respiratory muscle fatigue or severe airway obstruction, and therefore warrant immediate anaesthetic review.

A breathless patient who can only talk in short sentences could be in respiratory distress. Anyone with a respiratory rate >30 breaths per minute mandates rapid assessment, with consideration for critical care input as the increased work of breathing and respiratory muscle activity causes oxygen consumption to increase at a time when delivery may already be compromised. Sometimes the effort of breathing is so high that the patient requires intubation and ventilation to reduce this work load and divert oxygen delivery to vital organs. Patients with a very slow respiratory rate (<8) may also require ventilatory support.

Sick patients warrant mobile radiographic chest examination. It is worth requesting one early but this should not delay assessment and appropriate intervention. Administer supplemental oxygen and consider how to reduce the effort of breathing, e.g. with salbutamol for wheeze or nitrates for decompensated left ventricular failure. Oxygen therapy should be titrated and target-driven as assessed by

arterial blood gas concentration and/or peripheral oxygen saturation measurement. If the patient remains hypoxaemic despite increasing the inspired concentration of oxygen (FiO_2), non-invasive ventilation may be appropriate.

Non-invasive ventilation should be considered for all patients with chronic obstructive pulmonary disease with a persistent respiratory acidosis (pH 7.25–7.35) after a maximum of 1 hour of standard medical therapy (Roberts et al, 2008). Non-invasive ventilation is also useful in hypercapnic respiratory failure secondary to chest wall deformity (such as scoliosis or thoracoplasty) or chronic neuromuscular disease (Baudoin et al, 2002). Respiratory failure in acute progression of neuromuscular disease (e.g. Guillain–Barré syndrome or myasthenic crises) mandates immediate ventilatory support. Although patients with a pH ≤7.26 may benefit from non-invasive ventilation, such patients have a higher risk of treatment failure and should therefore be managed in a high dependency or intensive care unit environment.

C: circulation assessment and fluid resuscitation

If the patient is talking, he/she must have a reasonable cardiac output. Feel for the radial pulse to get an impression of the state of the circulation. Blood pressure measured non-invasively by oscillotonometry may be inaccurate at extremes of pressure, so perform a manual blood pressure measurement with a sphygmomanometer if uncertain. Secure or ensure vascular access. Any working cannula is worthwhile, but if rapid fluid or blood infusion is necessary, larger cannulae are required. If the patient is peripherally shut down, catheter insertion may be difficult and should prompt senior involvement to secure adequate access. Try and obtain blood samples for the essential tests outlined in *Table 2* from the inserted cannula or separate venous puncture.

Arterial blood samples are particularly useful because they provide information about gas exchange as well as the metabolic state of the patient. Invaluable parameters such as haemoglobin concentration, potassium and glucose levels can also be obtained within 5 minutes, allowing the prompt identification and correction of potentially life-threatening abnormalities. To assess alveolar gas exchange, the partial pressure of carbon dioxide ($PaCO_2$) should be noted alongside the ratio of the inspired to arterial partial pressure gradient of oxygen (PaO_2). The predicted PaO_2 should be approximately 10 kPa below the FiO_2; a figure in excess of this indicates significant respiratory compromise.

The base excess is better than pH in the evaluation of metabolic acidosis, and a base deficit of ≤4 is associated with appreciable morbidity and mortality (Smith et al, 2001). The results of a recent arterial blood gas sample will help the critical care team to assess the need for invasive monitoring as well as guide further management.

Shock is defined as an inadequate perfusion of tissues, insufficient to meet cellular metabolic requirements. The severity of shock approximates to the effective loss of blood volume. Blood volume does not actually have to be lost from the circulation, as an expansion in the circulatory system volume (for example in septic shock) will render the patient proportionally hypovolaemic. Systemic inflammatory response syndrome is a systemic response to a variety of initiators, of which infection is one. The diagnostic criteria for systemic inflammatory response syndrome require the presence of two or more factors outlined in *Table 3*.

Table 2. Useful blood tests

Full blood count
Clotting screen
Urea and electrolytes
Glucose
Liver function tests
Blood cultures
Group and save, or crossmatch
Venous blood gas

Table 3. Systemic inflammatory response syndrome criteria

Temperature	>38 or <36°C
Heart rate	90 beats/min
Respiratory rate	>20 breaths/min
White cell count	<4 or >12x10^9cells/ml
Acute alteration of mental state	

adapted from Bone et al (1992)

Sepsis is the commonest reason for intensive care unit admission. It is defined by the presence of systemic inflammatory response syndrome with evidence of infection. Severe sepsis on the other hand is sepsis accompanied by organ dysfunction (Bone et al, 1992). When attending to a hypotensive patient, the potential for sepsis as a cause of shock should be borne in mind, especially in a pyrexial or hypothermic patient.

Early goal-directed resuscitation of the septic patient during the first 6 hours after recognition improves outcome (Rivers et al, 2001). Fluid resuscitation with colloid or crystalloid should be initiated to maintain adequate circulating pressures. Broad-spectrum antibiotic therapy should be administered within 1 hour of diagnosis, ideally immediately following collection of blood cultures. Early urinary catheterization can aid assessment of response to fluid resuscitation, with adequate urine output >0.5 ml/kg/hour.

D: disability assessment

Assess the Glasgow Coma Scale or Alert/verbal/pain/unresponsive score. A patient who has a Glasgow Coma Scale score of ≤8 or an alert/verbal/pain/unresponsive score of P warrants anaesthetic assessment of the need for airway protection. Check pupils for symmetry, size and reactivity and quickly assess limb neurology. This is particularly important as some anaesthetic drugs may alter neurological examination findings. Never forget to check glucose levels in any patient who is agitated, confused or has altered consciousness.

E: review the evidence

Review the notes for events leading to admission, past medical history, progress as an inpatient, observation charts, drugs and interventions already instituted. Carry out a targeted secondary systematic examination, noting what the patient is attached to in the way of pumps, drains and fluids. The main aim is to gather information which will help you and the critical care team to establish the most likely cause of deterioration and hence guide therapy beyond initial stabilization. This information can also help to determine an appropriate ceiling of escalation of therapy.

Having systematically reviewed the patient and initiated management of treated life-threatening problems, it is now

time to synthesize a differential diagnosis. Contact the clinician responsible for the patient (for example the medical registrar out-of-hours) and discuss appropriateness of critical care admission.

Conclusions

Clinical deterioration is almost always identifiable using track and trigger systems. Early assessment and management of critically ill patients saves lives. Using a simple step-by-step algorithm helps identify the majority of signs that warrant critical care admission and provides structure for management as well as appropriate and efficient referral to the team. The basic principle of resuscitation in sick patients is to ensure that adequate amounts of oxygen are transported around the body. **BJHM**

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TOP TIPS

- Ask for help early and do not be afraid to delegate.
- Even if the exact reason behind the patient's deterioration is unknown, basic resuscitation should always be commenced promptly.
- Always reassess the patient after carrying out any intervention and ensure that monitoring and observations are carried out frequently.
- If repeat arterial blood gas samples are likely to be required, early arterial access is both humane and practically invaluable.
- Document, date and time all interventions and referrals accurately.

KEY POINTS

- Sick patients deteriorate over a period of time, which can be tracked by close monitoring of their physiological observations.
- High respiratory rate and low conscious level are the commonest disturbances before intensive care unit admission.
- Use a structured ABCDE approach to identify life-threatening problems, stabilize these, give adequate fluid resuscitation and early antibiotics and ask for help.
- Adequate oxygen delivery to tissues is the principal aim of resuscitation.
- Sepsis remains the commonest reason for admission to the intensive care unit.