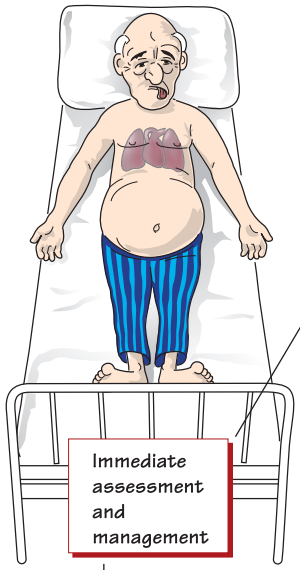
1 Recognizing the unwell patient

(a) Patient at risk early warning scoring system: *a score ≥5 indicates that a 'Patient At Risk Team' (PART) or 'Medical Emergency Team' (MET), composed of doctors and senior nurses familiar with assessment and management of acutely unwell patients, should be summoned*

Score	3	2	1	0	1	2	3
Heart rate (beats/min)	–	≤40	41–50	51–100	101–110	110–129	≥130
BP (systolic; mmHg)	≤70	71–80	81–100	101–199	–	≥200	–
Respiratory rate	–	≤8	–	9–24	–	25–29	≥30
S_aO_2 (%)	≤88	89–90	91–94	≥9	–	–	–
% Oxygen	–	–	–	–	≥8L/min or 40%	–	–
Core temperature (°C)	–	≤35	35.1–35.9	36–37.4	≥37.5	≥38.5	–
Conscious level	–	–	–	Alert	Drowsy; responds to voice	Acute confusion or agitation	Responds to pain only
Urine output	≤20mls/hr for 2hrs	<1ml/kg for 2 hrs	–	>500mls in 24hrs	250–500mls in 24hrs	<250mls in 24hrs	0/mls in 24hrs

(b) Assessing the acutely ill patient



Immediate assessment and management

Assessment + Action		Criteria for calling an emergency team
1. A – Airway →	Airway adjuncts recovery position	Airway obstruction, impaired airway protection (e.g. coma)
1. B – Breathing →	Oxygen, mask ventilation	Respiratory arrest, Respiratory rate <8 or >20 S_aO_2 <90% on 50% O_2, P_aO_2 <8kPa on 50% O_2 P_aCO_2 >6.5kPa, pH <7.3
3. C – Circulation →	Fluid Inotropes	Cardiac arrest, Heart rate <40 or >120/min SBP <90mmHg, pH <7.3, Lactate >2mmol/l Base deficit >–4, Urine output <0.5ml/kg/hr
4. D – Disability →	Neurological assessment Hypoglycaemia Injury/trauma	GCS <12, GCS drop of >2 points Recurrent or prolonged seizures

Monitor vital signs, S_aO_2 ± ECG; consider need to call for help

Full assessment; take history, full clinical examination, review charts, notes + results

Is the patient improving with initial management? → No → Reassess

Yes

Is the diagnosis established? → No → Further investigation → Management plan

Yes → Management plan

S_aO_2=saturation
P_aO_2=partial pressure of oxygen
P_aCO_2=partial pressure of carbon dioxide
SBP=systolic blood pressure
GCS=Glasgow coma scale
ECG=electrocardiogram

(c) Clinical features of underlying lung disease

Disorder	Chest wall movement	Percussion note	Breath sounds	Added sounds
Consolidation	↓ on affected side	↓ Dull	Bronchial	Coarse crackles
Collapse	↓↓ on affected side	↓ Dull	Absent or bronchial	None
Pleural effusion	↓ on affected side	↓↓ Stony dull	Diminished*	None (±rub)
Pneumothorax	↓↓ on affected side	Normal or hyperresonant	Absent or diminished**	None
Asthma/COPD	↓ on both sides Hyperinflation Accessory muscles	Normal or hyperresonant	Vesicular with prolonged expiration	Expiratory wheeze

In the acutely unwell patient, assessment of deranged physiology and immediate resuscitation precedes diagnostic considerations because incomplete history, cursory examination and limited investigation often preclude classification by primary organ dysfunction. It is this initial diagnostic uncertainty and the need for immediate physiological support that defines acute and critical care medicine.

Recognizing the acutely unwell patient

Early recognition that a patient's condition is deteriorating is essential and should initiate immediate action to correct abnormal physiology and prevent vital organ damage (e.g. brain, kidneys). Clinical severity may be obvious from the end of the bed: as in sudden, catastrophic events (e.g. pulmonary embolism); presentation with established severe illness (e.g. emergency room); or in advanced, previously unrecognized, deterioration on the ward. In these cases, organ damage may have already occurred but immediate action prevents further injury. It is failure to recognize progressive deterioration on the ward, usually manifest as worsening physiological variables, and initiate preventative action, that is a common and unacceptable cause of morbidity and mortality.

Identification of 'at risk' patients (e.g. sepsis, postoperative) allows complications to be anticipated and prevented. 'At-risk' patients must be monitored, deterioration recognized and appropriate action initiated. Simple physiological parameters including temperature, blood pressure (BP), heart rate, respiratory rate, urine output and conscious level correlate with mortality. One, two or three abnormalities correlate with 30-day mortalities of 4.4%, 9.2% and 21.3% respectively. Early warning scoring systems based on these parameters (Fig. a) promote early detection and trigger interventions aimed at preventing unnecessary cardiac arrests and critical care admissions.

Assessment of the acutely ill patient

A normal response to the question 'Are you alright?' indicates that a patient's airway is patent and that they are breathing, conscious and orientated. No response (e.g. coma) or difficulty responding (e.g. breathlessness) suggests serious illness. Immediate assessment and management of these acutely ill patients is summarized in Fig. (b). It aims to ensure patient safety and survival rather than establishing a diagnosis. Assessment starts with detection and simultaneous treatment of life-threatening emergencies. It uses the **ABC system**: **A** – Airway, **B** – Breathing, **C** – Circulation, in this order, as airways obstruction causes death faster than disordered breathing, which in turn causes death faster than circulatory collapse. Appropriate life-saving procedures or investigations are performed (e.g. airway clearance, tension pneumothorax decompression) during examination (i.e. before the next step). Simple monitors (e.g. saturation, BP) are used to assist assessment when safely possible.

Airway (Chapters 5, 13) Obstruction is a medical emergency and unless rapidly corrected leads to hypoxia, coma and death within minutes. Causes include aspiration (e.g. food, coins, teeth, vomit), laryngeal oedema (e.g. allergy, burns), bronchospasm and pharyngeal obstruction by the tongue when reduced tone causes it to fall backwards in obtunded patients.

- **Complete obstruction** is characterized by absent airflow (feel over the patient's mouth), accessory muscle use, intercostal recession on inspiration, paradoxical abdominal movement and absent breath sounds on chest auscultation.
- **Partial obstruction** reduces airflow despite increased respiratory effort. Breathing is often noisy, with 'stridor' suggesting laryngeal and 'snoring' nasopharyngeal obstruction.

Simple measures correct most airways obstruction. Suction removes blood, vomit and foreign bodies. Pharyngeal obstruction by the tongue (i.e. during coma) can usually be prevented by chin lift manoeuvres or insertion of an oropharyngeal (Guedel) airway (Chapter 13). Occasionally endotracheal intubation or rarely emergency cricothyroidectomy may be required.

Breathing (Chapters 5, 13) The most useful early sign that breathing is compromised is a respiratory rate <8 or >20/minute, whereas central cyanosis is usually a late sign. Examine depth and pattern of breathing, accessory muscle use, abdominal breathing and chest wall expansion. Abnormal expansion, altered percussion note (e.g. hyper-resonance), airways noise (e.g. stridor) and breath sounds may determine the cause of underlying lung disease (Fig. c). Saturation (S_aO_2), measured by pulse oximetry, and inspired oxygen concentration (F_iO_2) should be recorded. Arterial blood gases (ABG) provide information about ventilation as well as oxygenation (i.e. S_aO_2 may be normal but P_aCO_2 high due to poor ventilation). The S_aO_2 should be >90% in all critically ill patients. Respiratory acidosis (pH < 7.3, P_aCO_2 > 6.7 kPa) or hypoxaemia despite high flow oxygen therapy (S_aO_2 < 90%, P_aO_2 < 8 kPa) requires urgent intervention. Treatment depends on cause (e.g. COPD) and is discussed in later chapters.

Circulation (Chapters 5, 7) Assessment includes central and peripheral pulses (i.e. rate, rhythm, equality), BP, peripheral perfusion (e.g. limb temperature), urine output and conscious level. Initially BP is maintained by compensatory mechanisms (e.g. increased peripheral resistance). Cardiac output (CO) has to fall by >20% (i.e. equivalent to 1 L of rapid blood loss) before BP falls. Thready, fast pulses indicate poor CO, whereas bounding pulses suggest sepsis. Capillary refill time is usually <2 seconds and prolongation suggests poor tissue perfusion. Metabolic acidosis (base excess >–4) and raised lactate (>2 mmol/L) on ABG indicate tissue hypoxia. Hypovolaemia should be considered the primary cause of shock, unless there is obvious heart failure (i.e. resuscitate hypotensive patients with cool peripheries and tachycardia with intravenous fluids (Chapters 8, 9)).

Disability Neurological status is rapidly determined by pupil examination and conscious level assessment using simple scales (Fig. a) or the Glasgow Coma Scale (Chapters 3, 53). Hypoglycaemia, ischemia and injury (e.g. unrecognized hip fracture) must be excluded in every patient.

Full patient assessment When stability has been achieved, and assistance summoned, a thorough history and examination is required. The patient's notes, treatment, investigations and charts must be reviewed. Trends in physiological parameters are often more useful than isolated values. If the diagnosis has not been established arrange further investigations as appropriate. Document a clear management plan and communicate this to those involved.

Management of the acutely unwell patient frequently involves several teams (e.g. medicine, surgery, critical care) but should be a 'seamless' process in which co-operation, communication and patient interests are foremost. Treatment should occur in clinical areas where staffing and technical support are matched to patient needs.