Section 1 Diagnosis

Chapter 1

History and Examination

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The first rule of diagnosis, gentlemen!
Eyes: first and most; hands: next and least; tongue: not at all!

Sir Lancelot Spratt – as played by James Robertson Justice

In: Doctor in the House (1954, The J. Arthur Rank Organisation)

Introduction

Patients may be admitted to the specialist cardiothoracic critical care unit from a variety of sources (Figure 1.1). In all elective admissions, and in the majority of emergency admissions, a clinical history will already have been elicited and a physical examination performed – often more than once. Most patients will already have undergone extensive investigation or therapeutic intervention, and the underlying diagnosis or diagnoses will have been established. Despite this seemingly ideal situation, the cardiothoracic intensivist should adopt an inquisitive attitude and use the so-called 'history and physical examination' to confirm previous findings, assess disease progression and exclude new pathology. Contrary to popular belief, this is often the most efficient and effective means of predicting and detecting significant comorbid conditions. Clinical investigations should therefore be considered an adjunct to, rather than a substitute for, basic medical assessment.

In the critical care setting, particularly when a patient is physiologically unstable or has reduced consciousness, the conventional stepwise approach to the history and physical examination will usually require modification (Table 1.1). Indeed it may have to be conducted *during* or *after* initial resuscitation.

History

The Conscious Patient

All available sources of information should be drawn upon to construct as detailed a history as possible. Where the patient is conscious and able to respond to direct questioning, this important primary source of information should not be overlooked. Rather than using 'open' questions and expecting them to recount their entire current and past medical history in a concise fashion and in chronological order, it is often easier to ask the patient to confirm previously documented information and append newly acquired information as necessary. When faced with an acutely unwell and possibly deteriorating patient, the skilled intensivist needs to be able to quickly gather sufficient information to aid diagnosis and guide management. Of particular importance is the patient's understanding of their medical condition, their insight into treatment options and prognosis, and their expectations. Corroborative history from family and carers is also invaluable, especially in the setting of acute delirium or dementia, where the patient's own account may be unreliable. This information should be solicited and documented whenever possible.

Symptoms of cardiorespiratory disease (e.g. angina pectoris, dyspnoea, orthopnoea, syncope, palpitations, ankle swelling, etc.) (Table 1.2) should be actively sought, as should any recent progression in symptom severity. Symptoms should be described in terms of their nature (using the patient's own words), onset, duration, progression, modifying factors and associations. The impact of symptoms on functional status should be documented using the New York Heart Association (NYHA) classification and the Canadian Cardiovascular Society (CCS) angina scale.

Table 1.1 Modification of conventional history and physical for use in critical care

	Conventional	Critical care
History	History of presenting complaint Past medical history Past surgical/anaesthetic history Drug history, allergies, sensitivities Recreational substance (mis)use Educational level/native language Social/employment history Religious/cultural beliefs Family history Systematic enquiry Sensory impairments Review of medical notes	Handover information Review of medical notes Information from family members
Physical	Patient supine – reclining at 45° Cardiovascular Respiratory Gastrointestinal Genitourinary Neurological Integument	Patient supine, lateral or prone ABC (Airway, Breathing, Circulation) Lines, tubes, drains and catheters Drug and fluid infusions Ongoing physiological monitoring Anatomical examination

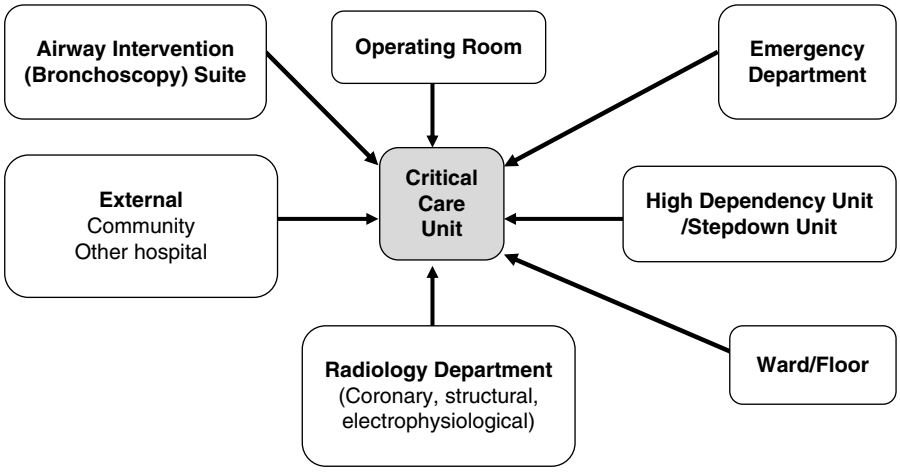

Figure 1.1 Cardiothoracic critical care admission sources.

Enquiry into the patient's past medical history should include coexisting conditions, previous hospital admissions, surgical procedures and complications, prolonged hospitalisation and unplanned admissions to a critical care unit. It is important to note the indication for any surgical procedure or therapeutic intervention (e.g. splenectomy, permanent pacemaker, angioplasty), the outcome of the procedure and any anaesthetic related morbidity. A history of difficult tracheal intubation is of particular note, both with respect to the unintubated patient who may require intervention during their stay, and the patient who is already intubated who will require extubation before discharge to the ward. Factors known to be associated with increased mortality and morbidity (e.g. congestive cardiac failure, peripheral vascular disease, renal insufficiency, arterial hypertension, pulmonary hypertension, diabetes mellitus, chronic pulmonary disease, neurological disease and previous cardiovascular surgery) should be documented.

Table 1.2 Common symptoms associated with cardiorespiratory conditions

Cardiovascular	Respiratory
Syncope	Recent overseas travel
Chest pain	Fever and/or rigors
Fatigue or exercise intolerance	Facial or sinus pain
Exertional dyspnoea	Chest pain
Paroxysmal nocturnal dyspnoea	Cough
Orthopnoea	Sputum production (volume, time course, purulence)
Palpitations	Haemoptysis
Intermittent claudication or ischaemic rest pain	Dyspnoea
Stroke or transient ischaemic attack	Exercise intolerance
Cough or sputum production	History of bird keeping, asbestos exposure, or other sources of occupational lung disease
Peripheral oedema	

Where the patient has been admitted following a diagnostic or therapeutic intervention (e.g. coronary angiography or angioplasty), a comprehensive medical and nursing 'handover' is essential. This is particularly important when the patient has been brought to hospital by emergency ambulance and taken directly to the angiography suite. Similarly, when a patient is transferred from another hospital for specialist cardiothoracic care (e.g. surgical repair of acute type A aortic dissection), a formal handover of clinical information and documentation is an absolute prerequisite for the transfer of clinical responsibility and for safe ongoing care. In many areas a formal handover document or aide memoire is used both to guide and to document the comprehensive handover of clinically relevant information.

It is essential to record current and recent prescription drug administration, including formulation, dosage and route of administration. In addition, the medication history should include drugs taken 'as required', proprietary or 'over-the-counter' medicines, complimentary or alternative therapies, and recreational drugs. This latter category should include alcohol and tobacco products. A history of allergic or other idiosyncratic reaction to a specific drug (e.g. suxamethonium) or class of drugs (e.g. penicillins) should be sought and documented.

Where adherence to a particular cultural or religious belief system (e.g. Jehovah's Witnesses) has the potential to influence any aspect of critical care management, this should be comprehensively documented. In some instances it may be appropriate to explore and document a patient's specific wishes in a number of hypothetical clinical scenarios, including limits of care. It is often preferable that limits of care be discussed with the patient and family early on in the critical care stay, rather than late in the course of the illness when the patient is in extremis. It is important that both the patient and the family have a realistic understanding of what intensive care can offer, rather than relying on preconceived ideas.

The Unconscious Patient

The unconscious, critically unwell patient represents a special challenge for any clinician. From a cardiothoracic point of view, such patients cover a wide range of potential presentations, including, but not limited to the following:

- A patient transferred from the operating theatre or catheter laboratory following an invasive procedure;
- A patient admitted following out-of-hospital cardiac arrest, via either the catheter laboratory or the emergency department;
- A patient requiring ongoing organ support following an interventional cardiology or bronchoscopic intervention; and
- A ward patient who has physiologically deteriorated and requires more advanced treatment modalities or resuscitation.

When reviewing an obtunded patient the clinician is deprived of many of the usual visual and auditory clues that guide patient assessment, forcing the use of alternative sources of information. Family members and carers are often the key source of information regarding recent symptoms, and it is often possible to establish the temporal course of the presenting complaint with thorough questioning. In many respects, it is often possible to obtain a full history, provided that the right questions are asked, and an open mind maintained.

A thorough review of the medical record is also invaluable when the patient is not able to speak for him or herself. Written correspondence from other clinicians (e.g. surgeons, cardiologists, respiratory physicians, general practitioners) will answer many

questions regarding the course of illness leading up to admission. Where questions remain unanswered regarding the previous clinical course, direct communication with these sources is encouraged, not only to obtain further information, but as a matter of courtesy regarding the condition of their patient.

Physical Examination

The Conscious Patient

Whilst a comprehensive physical examination is sometimes not possible given the limitations that reception and resuscitation of the critically ill patient places on assessment, a full physical examination should nevertheless be attempted. There is also a frequent temptation for the clinician to rely on the battery of monitors that an intensive care admission entails, especially during daily review of the patient, or to perform an investigation rather than seek clinical findings. This is a fallacy, as even an abbreviated physical examination during a ward round may reveal a finding (e.g. bronchial breathing) that may take hours to manifest as worsening hypoxia or increasing oxygen requirement, permitting early investigation and intervention.

General Inspection

This should initially be undertaken from the end of the bed, so as to better appreciate the overall Gestalt. The initial focus should be on the patient. Central or peripheral cyanosis may be evident in the setting of hypoxaemia or shunting. The patient posture provides many important clues, especially when assessing respiratory effort. Pursed lip breathing to increase end-expiratory pressure and a 'tripod' position with the shoulders rotated forward and the hands on the lower extremity to engage the accessory muscles are evidence of respiratory distress. Attention should then be turned to the various drug infusions being administered, the relevant concentration, rate and route of administration. Peripheral and central venous access should be noted and recorded including available lumens for other medications and the size of each catheter if the administration of volume is required. Invasive monitoring (e.g. arterial line, pulmonary artery catheter), circulatory support devices (intra-aortic balloon pump, ventricular assist device and extracorporeal circuits) and renal replacement therapy should also be evaluated. An indwelling urinary catheter may be present, and if so, the volume and concentration of urine in the drainage bag should be noted.

The postoperative cardiac or thoracic surgical patient will have a variable number of mediastinal and pleural drains in situ. The volume of blood in these should be recorded so that an accurate estimation of any ongoing blood loss can be made. An air leak may also be present when pleural drains are on suction, and the magnitude and respiratory phase of this should be judged. Where epicardial pacing wires are present, their function should be confirmed. If in use, external pacing should be converted from fixed rate mode to demand mode, with an appropriate backup rate.

The Hands and Arms

Examination of the hands reveals much about the circulatory state of the patient. Cold and shut down extremities with delayed capillary return may suggest a high degree of systemic vascular resistance, usually because of hypovolaemia or low cardiac output state, or alternatively, an acutely ischaemic limb. In contrast, warm peripheries suggest a normal or high cardiac output state. Finger clubbing may be indicative of chronic cardiorespiratory disease, notably congenital, cyanotic heart disease, non-small-cell lung cancer and suppurative lung conditions such as cystic fibrosis or bronchiectasis.

The peripheral pulses can give clues to the presence of significant valvulopathy (e.g. the 'water hammer' pulse of severe aortic regurgitation) and regional perfusion abnormalities, particularly in aortic dissection (i.e. radioradial and radiofemoral delay). Inspection of the palmar creases was popularised for the estimation of plasma haemoglobin concentration, but has subsequently proven to be unreliable. Rarely, the immunological and embolic phenomena of infective endocarditis (Janeway lesions and Osler's nodes) may be evident.

The Neck

Neck examination in the critical care environment is often difficult, due to the presence of indwelling jugular venous catheters. In the event that the neck is unencumbered, examination of the jugular venous waveform can be used to assess right atrial filling and compliance, atrioventricular dissociation (cannon a-waves) and torrential tricuspid regurgitation (massive cv-waves). These abnormalities are also visible on the central venous waveform if invasive monitoring is present.

If pericardial tamponade is suspected, an early sign of compromise is an increase in right atrial

pressure on deep inspiration (Kussmaul's sign). If the patient's trachea is not intubated, it is wise to conduct an airway assessment at this juncture if not already performed. Auscultation of the carotid arteries may reveal bruits consistent with turbulent flow if there is a substantial atheroma burden, or the referred murmur of aortic stenosis.

The Praecordium

As for other parts of the body, and as alluded to in the starting quotation, examination of the chest should follow the traditional route of observation, palpation, percussion and auscultation. Ideally, both the anterior and posterior chest should be examined, as the lower lobes of the lung (particularly on the left) can take up much of the posterior aspect, preventing examination of the other lobes if the anterior chest is not examined. The often high volume of ambient noise in the critical care environment may make ausculation challenging. Subtle abnormalities may be missed, and seemingly positive findings may be misinterpreted. It is wise to correlate findings not consistent with the overall condition of the patient with appropriate investigation. Radiological investigation and bedside modalities such as ultrasound and transthoracic echocardiography are valuable for this purpose.

The Abdomen

Initially, at least, the abdomen is rarely a focus in the cardiothoracic critical care unit. Interest in this region is limited largely to distension and the presence of bowel sounds or the absence thereof. However, small or large bowel ischaemia is a not uncommon phenomenon following cardiac surgery, as a result of a low cardiac output state, embolic phenomenon or use of intra-aortic balloon counterpulsation. A high index of suspicion is required for this condition, particularly in the setting of an unexplained lactataemia and worsening acidosis, despite the presence of a seemingly adequate cardiac output. The opportunity should be taken at this point to assess the back of the patient for sacral oedema, as this is the most dependent point in the semirecumbent patient, and is an important finding when assessing volume status.

The Legs

An assessment of the legs completes the examination. Like the hands, the lower extremities reveal much about perfusion status, thus capillary refill and skin temperature should be assessed. The posterior tibial and dorsalis pedis pulses should be sought, particularly if the femoral vessels have been used for arterial access. Whilst a rare event, acute lower limb ischaemia is a recognised complication of a wide range of invasive devices, in particular peripheral venoarterial ECMO cannulae and the intra-aortic balloon pump. It is important to note that even if a distal reperfusion line is incorporated into an ECMO circuit, distal pulses may be absent. However, the limb should feel warm and well perfused or, at the very least, similar to its counterpart.

Deep venous thrombosis is a common complication in many postoperative patients, and whilst at least half of these are completely asymptomatic, the remainder may exhibit the classical signs of calf tenderness, swelling, distended superficial veins and warmth. The traditional test for this condition, Homan's sign (rapid passive dorsiflexion of the ankle with the aim of causing pain in the calf), is no longer recommended because of the risk of clot fragmentation and acute pulmonary embolism.

Finally, the presence and extent of any peripheral oedema should be assessed. Oedema is, by definition, an excess of interstitial fluid, and therefore must be the result of a derangement of the Starling forces across the microcirculation (increased capillary hydrostatic pressure, decreased plasma colloid oncotic pressure, increased capillary permeability or deranged lymphatic drainage).

The Unconscious Patient

As for history, the physical examination of the unconscious individual is hindered by the lack of patient participation. Nevertheless, such an examination should always be undertaken with the same care as if the patient were awake and fully conscious. The presence of the mechanical ventilator at the bedside increases the ambient noise level, further impairing the ability of the clinician to auscultate. Heavy sedation or neuromuscular blockade naturally prevents patient movement, and simple tasks such as leaning the patient forward to auscultate the chest are impossible. Nevertheless, an attempt should be made, as much valuable information can still be gained, particularly with respect to tissue perfusion.

As for physical examination in the conscious patient, assessment of the unconscious patient should follow in the same stepwise fashion. Many of the same clinical features may be found on careful inspection.

Caution should be taken during joint manipulation and palpation. The patient will not be able to report discomfort or resist painful movements, and tissue damage may result if the examiner is overly rough. Examination of the abdomen in the unconscious patient is considerably confounded, especially in the setting of neuromuscular blockade. This is because the early features of gut ischaemia or peritonism will be absent, partly because the patient is unable to report discomfort, but also because of a lack of abdominal muscle tone. As a result, the early features of guarding and tenderness to percussion (formerly tested as 'rebound tenderness') are absent. Consequently, abdominal distension, free gas under the diaphragm and a rising lactate in the setting of apparently adequate cardiac output may be the only features of a major intra-abdominal pathology. A high index of suspicion must be maintained as a result.

Daily assessment of the unconscious patient should also include a brief neurological examination. Naturally, a full assessment of muscle power cannot be undertaken, but a brief examination for features of an upper motor neurone lesion such as hypertonia, hyperreflexia and clonus (in the absence of neuromuscular blockade) can be quickly and easily performed. As described in detail in Chapter 16, on sedation and analgesia, the indications for deep sedation and neuromuscular blockade are becoming fewer as cardiothoracic critical care evolves, and targeted sedation and sedation breaks are increasingly de rigueur. Conscious state can be graded with any number of specialist sedation scores, which are beyond the scope of this chapter – however, response to approach, voice and pain should be assessed. A variety of different techniques have been described to evaluate response to painful stimulus. However, firm pressure over the superior orbital notch is usually the most unambiguous means of assessing global response, as peripheral stimulation may not give an accurate assessment of localisation if a hemiplegia is present. Likewise, withdrawal to stimulation, decerebrate and decorticate posturing can be difficult to assess when the focus point is on the hand or foot.

Conclusions

The presence of advanced monitoring modalities and ready access to bedside investigations, combined with difficult examination conditions, are all powerful motivators to de-emphasise the traditional focus on history and examination. Whilst cardiothoracic critical care requires a different skill set to that of the emergency department or ward, the temptation to forgo the basic diagnostic process must be resisted, as history and examination findings serve to clarify the clinical scenario and highlight evolving problems that monitoring may not detect for some time. Furthermore, history and physical examination allow appropriate targeting of investigations, minimising patient discomfort and unnecessary cost to the health system.

Learning Points

- The cardiothoracic intensivist should adopt an inquisitive approach to history and physical examination so as to confirm previous findings, assess disease progression and exclude new pathology.
- It can be challenging to elicit a history and undertake a physical examination in the critically ill patient and it may be necessary to modify the conventional stepwise approach.
- Advanced monitoring modalities are prone to artefact and incorrect interpretation and should not be seen as a substitute for a thorough history and physical examination.
- On admission/discharge from cardiothoracic critical care a formal handover of clinical information is an absolute prerequisite for continuity of care.
- It may be necessary to explore and document a patient's specific wishes in a number of hypothetical clinical scenarios so as to inform decision making should the patient deteriorate.

Further Reading

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