

# History taking

# &

# Clinical Examination

A guide for Advanced Paramedics

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## Introduction

Good clinical assessment is the cornerstone of good AP practice and underpins the advanced practitioner's differential diagnosis and subsequent treatment plan. The environment, the limited resources available and the time constraints involved in pre-hospital care make the task of accurate patient assessment all the more challenging for the advanced paramedic. However, obtaining a good history and eliciting the important clinical signs, is one of the most rewarding aspects of patient care. It is the hallmark of a good clinician and is a skill which never dates.

This guide is designed to provide a framework for pre-hospital practitioners in focussed history taking and clinical examination. It is a learning adjunct; the most effective learning method is practice and more practice. Advanced paramedic practice has inherent risks involved and safe implementation of the clinical practice guidelines depend on an accurate patient assessment.

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## Chapter 1: General Principles

Creating a rapport with the patient and gaining their trust is a key skill when taking a history. This is not always possible due to the nature of the illness/injury, communication difficulties or previous experience. One of the most important factors in this relationship is letting the patient know that they have been heard, that you believe them and that you want what's best for them.

On approach, introduce yourself and your role to the patient. Explain that you are there to take care of them. When possible be at eye level when taking the history. Start by asking an open question relating to the presenting complaint or why they called the Ambulance Service. Allow for silences and use gentle encouragement to let them continue their story (eg "go on" and "what happened then"). Encourage the patient to describe how they feel, rather than tell you what someone else says is wrong with them.

While open questions are always encouraged, there are times when closed questions are useful in the history (eg "is this pain worse than when you were in labour?") or when the patient has a myriad of complaints (eg "what is bothering you most at the moment?"). Try to avoid the trap of asking leading questions (eg "did the pain move?" is preferable to "did the pain radiate into your neck and arm?"). Repeating the history to the patient is often useful. Closing the assessment with "Have I forgotten anything?" or "Is there anything else you'd like to tell me?" is good practice. A collateral history from relatives or friends, the patient's environment or apparent inconsistencies (eg an unkempt patient in a neat house) can inform the history.

### Structure of a Medical Patient History

Presenting complaint (Pc)

History of the presenting complaint (HPc)

Past Medical History (PMHx)

Past Surgical History (PSx)

[Past Psychiatric or Obstetric History if relevant]

Family History (FHx)

Medications

Allergies

Social History (SHx)

Systems review (SR)

### Structure of a Paramedic History

**S** Signs and Symptoms

**A** Allergies

**M** Medications

**P** Past Medical History

**L** Last Meal

**E** Events (leading to illness)

## 1.1 The presenting complaint

This is the reason that the patient sought medical advice or called the ambulance. Taking the history in chronological order is important eg when were you last well? Describe how the symptom first began.

What happened next?

Define what the major symptoms are, that is, what the patient feels. Let them use their own words. You will elicit signs later.

If a patient uses a medical term, ask them what they mean as sometimes their understanding is different to yours eg patients commonly call a severe headache “migraine” and an inaccurate label is applied.

Asking a patient to point to the affected area is often useful.

Establish if the symptoms are improving, deteriorating or unchanged. How severe are the symptoms?

Common symptoms include pain, nausea, vomiting, weakness, shortness of breath, reduced mobility, difficulty with either micturition or defaecation and numbness.

Sometimes the patient will not volunteer the history and a collateral history is required. This often arises if the symptoms are confusion, aggression, disinhibition, drowsiness or an inability to speak.

Is there anything that makes the symptoms worse (aggravating factor) or better (relieving factor)?

Find out what other symptoms are associated with the primary problem and the timing of them.

### History of presenting complaint

Important questions here include:

- The onset of symptoms (a sudden or rapid onset often suggests a mechanical problem eg a perforation, a bleed, a tear or a break). If the patient is vague, ask if they had the symptom at a particular time eg were you well at mass/Christmas/a birthday?
- Previous similar episodes
- Find out what the patient was doing when the symptoms began.
- Are they on any treatment for that condition and when did treatment start?

## 1.2 Past History

### Past Medical History

Important medical conditions include: asthma or other breathing problems, previous heart disease (including blood pressure, angina or heart attack, an irregular heart beat, a weak heart muscle), diabetes, kidney disease, stomach ulcers or bowel disorders, liver disease, neurological disorders (eg epilepsy, a stroke or brain haemorrhage) or infectious disease (eg TB, HIV, hepatitis). Were they ever badly injured?

### Past Surgical History

Did they ever have an operation? Were there any complications with the operation? Were there any complications with the anaesthetic?

### Past psychiatric history

This is often not relevant to the presenting complaint and need not be included. However, sometimes it is useful to establish if the patient has ever been treated for depression, anxiety, mood swings, abnormal or unusual thought processes or previous hallucinations. Are they still on therapy? Were they hospitalised? Have they ever hurt themselves or wanted to hurt themselves?

Have they ever been diagnosed with an addiction (to alcohol, drugs, cigarettes, gambling, sex or work)?

Are any of these more important than other key relationships in their lives?

Are there any major life-events occurring at present? Either positive (getting married, a promotion, moving house or new baby) or negative (separation, bereavement, financial difficulties or loneliness)?

### Past Obstetric or Gynaecological History

“All women aged between 10-50 years are presumed to be pregnant until proven otherwise”.

Ask about the possibility of pregnancy in a sensitive manner.

Only if relevant, establish the date of their last menstrual period, if they are sexually active, using contraception or if they have had any irregular bleeding or periods.

Important obstetric questions include: number of pregnancies, live births, still births, miscarriages or terminations. Also ask about previous obstetric complications or surgery.

If the patient is pregnant, establish if it is a single or twin pregnancy, if they are attending ante-natal care, if there are any complications, can they feel the baby move or have they any pain or PV bleeding.

### Family History

Relevant pre-hospital questions include a history of sudden death, cardio-vascular disease, severe allergy, brain haemorrhage or bleeding disorders.

### 1.3 Medications and Allergies

People can be on a myriad of medications, many not directly relevant to pre-hospital practice but are of great importance to medical and nursing staff. Therefore, the role of the paramedic is often in ensuring that the patient's medication or medication list travels with the patient.

Patients often think that you only need to know about prescription medication so do remember to ask about over-the-counter medication, alternative treatments and "recreational" drug use. Look around the house for empty packets in the case of suspected overdose or reduced level of consciousness.

It is important to recognise some medications and ask about them, specifically, medications that increase the risk of bleeding, that alter vital signs or reduce consciousness and those that are dangerous if taken in excess. Examples of these include; warfarin, aspirin and clopidogrel increase bleeding,  $\beta$  blockers reduce heart rate, opiates eg codeine or morphine and benzodiazepines eg diazepam, temazepam can reduce consciousness and drugs that are dangerous in excess include digoxin, lithium and theophyllines.

The timing of recent medication can also be directly relevant to paramedic practice eg when did an asthmatic last take their inhaler or a person with angina take their GTN spray.

#### Allergies

Establishing if a patient has ever had an adverse reaction to a medication is important. This is a crucial step that must be documented before any pharmacological therapy is considered. Sometimes it is difficult to differentiate if the patient had an allergic reaction or whether the reaction was a recognised side effect of the treatment. A severe allergic reaction or anaphylactic reaction includes facial swelling, especially of the mouth and throat, bronchospasm and respiratory distress, haemodynamic shock and reduced level of consciousness. The reaction to the medication should be noted.

### 1.4 Social History

This includes the person's current or previous occupation, their living conditions, their hobbies and travel history. Important questions also include smoking history, alcohol use and recreational drug use/drug dependence. Not all of these questions are directly relevant to pre-hospital practice but are useful in specific circumstances.

Pre-hospital practitioners though play a vital role in describing a person's living conditions and should convey their assessment to the receiving staff. Important considerations include socially vulnerable people or those with little social supports. Report any suspicions of abuse eg to children or the elderly in line with local or national policy.

Are they at risk of any infectious disease (TB, needle-sharing, unprotected sex, tick bites or foreign travel)?

## 1.5 Systems review

### General questions

This is a good time to get an overall impression of the patient. Key screening questions include any recent changes in weight, appetite, energy and sleeping. New onset fevers, sweats and weight loss can be important findings. Any increased bruising/bleeding. Establishing their fitness or exercise tolerance is useful.

### Cardiovascular

The heart is like an engine and failure of any components can result in the heart not performing. Essentially it is a pump with the left ventricle doing most of the work. The blood moves around the heart through a series of valves which may either thicken (stiffen) or become incompetent (floppy). The heart pump requires an intact electrical system and a good supply of oxygenated blood to the heart muscle to enable work efficiently.

Taking a cardiac history involves checking that all these components work.

Reduced blood supply presents with **chest pain** or discomfort (often like a band or tightness) which may move or radiate into the neck, jaw, shoulder or left arm. The pain may come on with a fixed amount of exercise (stable angina) or suddenly at rest (suggesting a critical ischaemia or acute coronary syndrome).

An inefficient pump causes an accumulation of fluid and reduced output. Left heart failure results in fluid gathering in the lungs so the person may present with **dyspnoea** (shortness of breath) or shortness of breathe lying flat (**orthopnoea**). To compensate for this positional problem it is often useful to ask patients how many pillows they sleep with. Right heart failure results in fluid gathering in the lower limbs (**peripheral oedema**) or sacrum (**sacral oedema**) and in the neck veins. Patients with pump failure may have a very **limited exercise tolerance**.

Electrical disturbances may result in a feeling of **palpitations** (an awareness of the heart beating) which may be fast or slow, regular or irregular. The patient might be able to tap out the rhythm. Other disturbances may result in **dizziness, light-headedness** or **collapse** as not enough blood reaches the brain.

Valve problems may result in sudden collapse, weakness/light-headedness or dizziness or reduced exercise tolerance.

The heart sits in a sack called the pericardium. If this gets inflamed it causes a sharp pain which increases with movement. If it fills with fluid the heart no longer pumps effectively.

### Cardiovascular

Atherosclerosis is a process that involves all arteries, so as well as having cardiac symptoms the patient may present with symptoms relating to other affected arteries. If the lower limb arteries are involved the patient may complain of calf pain on walking (**intermittent claudication**) or they may have pale, cold, painful toes and feet, leg ulcers or ischaemic (dead or black) toes. Atherosclerosis affecting the carotid arteries may cause a stroke (facial droop, weakness or slurred speech), a transient neurological deficit (TIA) or loss of vision called amaurosis fugax (like “a curtain coming over the eye”). Disease of the Aorta may result in sudden severe back or abdominal pain with or without collapse.

### Respiratory

Breathing difficulties may arise because of:

- a) Infection – localised or generalised
- b) Airway narrowing – either reversible (asthma or bronchospasm) or obstructive (COPD)
- c) Airway disease that results in either thickening/fibrosis of the airways, destruction of the small airway (bullous disease) or lung collapse (pneumothorax)
- d) Reduced blood supply
- e) Trauma

Sometimes damage to the respiratory centre in the brainstem or medication will reduce the respiratory rate. The respiratory rate can increase in the absence of lung disease (if the patient is shocked or acidotic).

Important history findings include:

1. **Cough** – is it productive (**sputum**) and if so what colour (white, yellow or green) and what volume (teaspoon, tablespoon, eggcup or cup)?
2. Coughed up blood (**Haemoptysis**) – bright red or brown. What volume?
3. Pain due to inflammation of the pleura (**pleuritic pain**) is sharp and increases with coughing and deep inspiration. Pain due to musculoskeletal injury is sharp and increases with coughing, breathing, movement and is often tender to touch.
4. Shortness of breath (**dyspnoea**). Establish the patient’s exercise tolerance. Are they dyspnoeic with strenuous exercise, moderate exercise, minimal exercise or at rest?
5. Any fever, chills, rigors or night sweats?
6. Any **wheeze** or chest tightness?
7. Do they smoke?

### Gastro-intestinal

Important symptoms include:

1. Reduced appetite (**Anorexia**); Are they not hungry? Afraid of eating? Hungry but gets full quickly?
2. Difficulty swallowing (**Dysphagia**); Can they swallow liquids, bread or meat?
3. Nausea
4. Any reflux symptoms; Epigastric burning? Heartburn? Belching?
5. **Vomiting**: When do they vomit? What do they vomit? Is it projectile? How many times? Any blood, coffee ground material (**haematemesis**) or yellow-green bile? Does it relieve any pain?
6. Abdominal pain; is it sharp or dull? Is it **colicky**? Does it increase with movement? Where is the pain and does it radiate?
7. Any change in bowel habit? **Diarrhoea** – number of stools and colour. Any mucous? **Constipation**; absolute (passing nothing including flatus) or partial (passing small amounts or passing flatus). Any fresh blood in the stool? Any black stools (**malena** or digested blood)? Are they foul smelling?
8. Any **incontinence** of faeces?
9. Any **jaundice** (yellow skin or eyes), pale stools or dark urine? (Liver disease)

### Renal/Sexual Health

The kidneys sit along the back of the abdominal wall just under the lower ribs. Pain in this area can suggest renal injury. Dull, constant **pain** suggests infection, bruising or a possible blockage in urine flow resulting in dilatation of the renal pelvis (hydronephrosis). Sharp, intermittent, severe (**colicky**) pain radiating from loin to groin that causes the patient to move around is suggestive of a renal calculus (stone).

The bladder sits directly behind the pubic symphysis. Infection here is frequently termed a *Urinary Tract Infection* and can cause burning during micturition (**dysuria**), **urgency**, **frequency** and **nocturia**. Infection in the kidneys is termed *pyelonephritis* and presents with dysuria, renal angle tenderness, nausea or vomiting and fevers/**rigors**. Both may present with blood in the urine (**haematuria**).

**Incontinence** is the inability to control the need to micturate.

Prostate enlargement can cause “obstructive” symptoms ie difficulty with urine flow and the patient may complain of urgency but then has difficulty passing urine (**hesitancy**) and feels they have not completely emptied their bladder (**incomplete voiding**), **dribble** or needs to go again (**double voiding**).

Sexual health questions are often not required in a pre-hospital assessment. Suggestions of infection include ulcers, warts, vaginal or penile discharge, deep pain during intercourse (**dysparunia**), irregular bleeding or bleeding after intercourse.

Acute testicular problems present with sudden, severe pain (possible torsion and this is an emergency), tenderness, increase in size or discolouration.

### Skin & joints

From a pre-hospital perspective this section mainly relates to acute injury. The patient may complain of pain, reduced movement, loss of function, numbness or altered sensation.

Acutely inflamed joints (either from a bursa, an inflammatory arthritis or joint infection) may present with red (**erythema**), hot, swollen, tender joints that they have difficulty moving.

Skin infections cause the area to be red, hot, swollen (**oedematous**) and tender. There may be pus if there is an infected wound or ulcer.

Some serious conditions present with a rash, particularly meningococcal disease, which is a small dark purple rash that does not fade with pressure (**purpuric rash**). Always ask about and document the presence or absence of a **headache**, **neck-stiffness**, **photophobia** (light hurting the eyes) or temperature if a patient has a rash.

### Neurological

The brain tissue does not perceive pain well so disorders within the brain can present with pain due to stretching or irritation of the meninges or a loss of normal brain function. Patients may complain of

1. Headache; sudden onset can suggest a bleed, early morning can suggest raised intracranial pressure, frontal can suggest tension or sinusitis and severe, unilateral can suggest migraine.
2. Nausea or vomiting
3. Visual disturbance – blurred, double (diplopia) or visual loss
4. Meningeal irritation: photophobia, neck stiffness, reduced consciousness
5. Limb weakness (**paralysis or paraparesis**)
6. Facial weakness
7. Numbness/altered sensation (**parasthesia**)
8. Abnormal speech (**dysarthria**) or understanding
9. Abnormal behaviour
10. **Hallucinations**; visual suggest organic disease, olfactory suggest epilepsy, auditory suggest psychiatric disease

The peripheral nervous system may also be damaged at the level of the spinal cord or along the peripheral nerve itself. Autonomic dysfunction often presents with loss of sympathetic function so the person may not be able to regulate their heart rate, blood pressure or skin temperature appropriately. Damage to the peripheral nerve may result in abnormal sensation (**parasthesia**) or partial or complete loss of function (**paralysis or palsy**).

## Important symptoms

General: fevers, sweats, weight loss, energy and appetite

Cardiac: Chest pain, shortness of breath, orthopnoea, swollen ankles, palpitations, dizziness, light-headedness, reduced exercise tolerance.

Cardiovascular: calf pain on walking; pale, pulseless, painful & cold legs; TIA's; transient visual loss.

Respiratory: Cough, haemoptysis, pain, dyspnoea, fevers, sweats, wheeze

Gastro-intestinal: Anorexia, dysphagia, nausea, vomiting, altered bowel habit, pain, incontinence, haematemesis or malena?

Genito-urinary: Pain, dysuria, urgency, hesitancy, incontinence, haematuria, rigors

Skin & Joints: Pain, loss of sensation or function, oedema, erythema, rash

Neurological: Headache, paralysis, parasthesia, meningism, dysarthria, vomiting, visual disturbance.

## CLINICAL EXAMINATION

### 2.1 General Principles

Learning to examine a patient in a systematic way is a skill that requires enormous practice but is very rewarding. It is all the more challenging in the pre-hospital setting as modesty and environmental factors often limit your ability to adequately expose the patient. Nonetheless, it is best practice to plan to perform a thorough exam and then modify that approach depending on the local constraints.

People, for a variety of reasons, may be reluctant to be examined. It is important to obtain consent before you proceed. Consent may be *implied* (for example, if the practitioner asks the patient to open their shirt so that they can listen to their heart and the patient proceeds then they have implied consent) or *express* (the practitioner asks can they examine the person and they say yes). Written consent is rarely obtained in a pre-hospital setting. The patient, having consented to an examination, can later withdraw their consent and the examination stops.

Practitioners often form opinions about a patient's health status from the beginning of the interaction. The knowledge they gain is often sub-conscious and one of the skills involved in performing an examination is converting *sub-conscious knowledge* into *conscious knowledge*. An experienced practitioner will often know that a patient is critically ill but may not have the ability to translate this knowledge into a common medical language. Repeat practice is what is required to translate the picture that you see into a language that conveys your impression to your colleagues.

The most important equipment required for clinical examination is your own senses – eyes, ears, smell and touch. Other very useful tools are a stethoscope, a watch and a pen-torch.

Ideally, patients are assessed on a trolley or bed with a mobile backboard. This facilitates the patient to sit up at a 45° angle for the majority of the examination but allows them lie flat for the abdominal examination. The practitioner traditionally stands on the patient's right side. This is not always possible in a pre-hospital setting.

The general approach to examining the cardiovascular, respiratory and abdominal systems is *Inspect, Palpate, Percuss and Auscultate*. The approach to limb examination is generally *Look, Feel and Move*.

## 2.2 Initial Impression

It is important to stand back from the patient initially and assess several factors including:

1. Mobility
2. Comfort/discomfort levels
3. Colour
4. Work of breathing
5. Weight/nutritional status
6. Cognitive Status

These factors, often part of your subconscious assessment, give you the vocabulary to convey your initial impression and assist in deciding if the patient is stable, unstable or potentially unstable.

### Mobility

Pain can have a dramatic effect on a person's ability to move. Sometimes pain causes the patient to adopt a protective gait eg an injured arm, severe peritoneal abdominal pain causes the patient to lie completely still as movement provokes the pain while colicky pain often has the patient writhing around as they try to find a comfortable position. Comfortable weight bearing post trauma is often reassuring that there is no immediate life or limb threatening injury.

### Comfort/discomfort levels

Watch the patient to look for signs of distress. Are they grimacing with pain? Are they nervous about following instruction? Are they easily distracted? Is there an inconsistency between their presenting complaint and their behaviour? Are they unshaven? What is their emotional state?

### Colour

This is very useful. Often, the initial response to shock, is a profound peripheral vasoconstriction resulting in pale, cold and clammy skin. Sepsis and anaphylaxis conversely result in a peripheral vasodilatation (distributive shock) so the skin may be warm, red and clammy. Cyanosis, a blue discolouration of the skin and mucous membranes is a marker of hypoxia. Jaundice, a yellow discolouration of the sclera of the eyes and the skin, is a marker of liver disease. Pallor, without the signs of shock, may be a marker of anaemia.

### Work of breathing

A full respiratory assessment is performed later. Markers of respiratory distress at this stage include a "tripod" position (sitting forward with arms extended to maximise lung capacity), increased or decreased respiratory rate, the use of accessory muscles (in the neck, between the ribs and in the abdomen), noisey breathing (stridor, wheeze or gurgling) and difficulty speaking.

### Weight/nutritional status

Acute weight gain around the abdomen is often due to one of the 5 F's: Fat, Fluid, Faeces, Flatulence and Foetus. A history may give further information on this. Fluid retention is often due to failure of either the heart, liver or kidneys or in very low protein states.

Weight loss is often not recognised by the patient. Clues include temporal wasting (a loss of the muscle at the side of the eyes, creating a hollow), a new notch on the belt or an increase in the amount of loose clothes. Wasting of specific muscles eg the quadriceps muscles can suggest a long standing injury or prolonged immobility. Severe weight loss is referred to as cachexia or the person is cachectic.

### Cognitive status

This is a quick screening tool and the AVPU score is very useful; Are they alert, responding to voice, responding to pain or unresponsive. If they are alert it is useful to confirm that they are orientated to person, place or time.

## 2.3 The Hands

The hands are usually exposed and easy to examine. They give important information on many conditions: Hypovolaemic and cardiogenic shock may result in pale, cold and sweaty hands while distributive shock may result in warm, clammy hands.

Nail changes can give information about systemic illness, a specific condition called clubbing may indicate serious cardiac or respiratory disease.

Patients with arthritis can have specific bony deformities and nodules on the hands, sometimes associated with muscle wasting if severe.

Liver disease can cause yellow discolouration, red palms (palmar erythema) and easy bruising. A flexion contraction of the 4<sup>th</sup> finger (Dupuytren's contracture) is associated with alcoholism, manual work or is familial.

Pallor of the palmar crease may indicate anaemia.

Some patients have a tremor; this can be caused by cerebellar disease, movement disorders such as Parkinson's Disease, carbon dioxide retention, anxiety or hyperthyroidism. An essential tremor is a benign condition where no medical cause is found.

Cigarette smokers may have nicotine staining of their index and middle fingers.

Some patients may wear medic alert bracelets.

### The Pulse

When examining the pulse look for the *rate*, the *rhythm* and the *character/volume*. The rate of the pulse is the number of beats per minute. The rhythm is whether it is regular or irregular. Sometimes an irregular pulse is caused by a heart block, atrial fibrillation or an extra or additional beat called an ectopic. Some young people may have a variation in rhythm due to inspiration. A rhythm strip helps clarify the cause of the irregularity. The volume of the pulse is whether it is weak and low volume, normal or bounding and large volume. The former is caused by low cardiac output states (shock, aortic stenosis, pericardial effusion) while the latter is caused by high output states (early distributive shock, exercise, some congenital heart disease) and carbon dioxide retention.

## 2.4 Head and Neck

Again, this is an area that is easy to examine as it is generally exposed but it is often overlooked.

Hydration is best assessed here; dehydration is evident with sunken eyes, reduced skin turgor (gently pinch the skin over the clavicle) and dry mucous membranes (lips and tongue) while volume overload is seen by an increase in the Jugular Venous Pulse or JVP (lower limb oedema and bilateral creps in the lungs support this finding). The JVP will be discussed below.

Pallor may indicate shock or anaemia; anaemia is suggested by pale palmar creases and conjunctival pallor (gently pull down the lower eyelid and normally a criss-cross pattern of red capillaries are evident).

### The eyes

The sclera (white area) of the eye maybe discoloured; yellow discolouration suggests jaundice while redness may suggest local eye trauma or a systemic inflammatory condition.

An increase in the number of red capillaries across the eye (**conjunctival injection**), associated with a film of water over the eyes (**chemosis**), like a tear that doesn't fall suggest carbon dioxide retention.

Creamy-yellow plaques on the eyelids are called xanthelasma and may indicate hyperlipidaemia.

### The cheeks and nose

Some discolouration over the cheeks follow classic patterns likes the butterfly rash of systemic lupus disease or the malar flush of previous rheumatic fever (these patients often have atrial fibrillation, have had a valve replaced and may be on warfarin). A red, prominent nose may be associated with heavy alcohol ingestion (rhinophyma).

### Mouth

Look inside to assess for hydration, central cyanosis (under the tongue), mouth ulcers and dentition.

### The Neck

Lumps in the neck are commonly due to enlarged lymph glands (lymphadenopathy), an enlarged thyroid (a goitre), sebaceous cysts or lipomas. Look for scars of previous surgery.

Assess if the patient is using any accessory muscles in breathing and that the trachea is central.

The **JVP** is a venous pulsation visible in the neck and as the internal jugular vein runs directly into the right atrium it can be used to reflect the volumes (and indirectly the pressure) in the right side of the heart. It is normally measured with the patient sitting at 45° and their head turned away from you. It runs between the 2 heads of the sternocleidomastoid muscle up to the pinna of the ear. When the JVP is visible more than 3cm high this suggests increased right heart volumes.

## 2.5 Chest

The two major systems within the thoracic cavity are the respiratory system and the cardiovascular system. The principles of inspect, palpate, percuss and auscultate apply here. The patient is examined sitting up at a 45° angle and then sits forward to allow examination of the back.

### The Respiratory System

Before moving on to the thoracic cavity assess the patient's work of breathing, look for signs of hypoxia and signs of carbon dioxide retention and look for markers of systemic disease. Work of breathing is discussed in section 3.2. Signs of hypoxia include central cyanosis (blue discolouration of the mucous membranes), increased respiratory effort and low saturations on a pulse oximeter. Signs of CO<sub>2</sub> retention (or narcosis) include a tremor and flap in the hands, a bounding pulse, a reduced level of consciousness, conjunctival injection and chemosis. Systemic markers include nail clubbing and nicotine staining. Palpate the trachea to determine if it is central or deviated.

### *Inspection*

Look at the **shape** of the chest, look for **scars**, look at the **rate** and **depth** of breathing. Are both lungs moving **symmetrically**? Chest deformities may suggest long-standing respiratory disorders and these deformities include being barrell-shaped (a sign of over-inflation), having a spinal deformity (kyphosis or scoliosis) or having an abnormal sternum (pectus excavatum and pectus carinatum). Scars might suggest previous lung surgery for TB, recurrent pneumothoraces or trauma. Asymmetry may indicate either a pneumothorax, lung fibrosis or a pleural effusion/haemothorax.

### *Palpate*

Palpate each side of the chest both anteriorly and posteriorly feeling for **tenderness** and asymmetrical **movement**. Air trapped within the tissues of the chest wall (often as a result of an airway rupture) produces a classic "crackling" sensation (like walking on rice crispies) and is called **sub-cutaneous emphysema**. It is a very significant finding.

Chest **expansion** can be measured at this stage.

### *Percussion*

This is a very useful skill but requires a lot of practice to perfect. It involves tapping the middle finger of your dominant hand against the middle finger of your non-dominant hand which is placed on the patient's chest. Ideally, your dominant hand rests above (not perpendicular to) your non-dominant hand and the movement occurs at the wrist.

Practice! Percussion over a normal area of lung is called **resonant**. An area of **dullness** is due to the accumulation of fluid either from consolidation (eg pneumonia), haemorrhage (a haemothorax) or fluid between the layers of the pleura (a pleural effusion). **Hyper-resonance** is due to an accumulation of air (eg a pneumothorax).

### *Auscultation*

There are two sides to many stethoscopes; a bell and a diaphragm. Generally the diaphragm (larger disc) is used in the respiratory exam. The chest must be examined both anteriorly, posteriorly and in the axilla. The rationale for this is that the upper lobe of the lung is found primarily anteriorly and the lower lobe posteriorly. Anteriorly, listen above the clavicle, below the clavicle, at the level of the nipple and below the nipple on both sides. Then listen in both axilla. Sit the patient forward and listen to the back; between the top of each scapula, between the blades of each scapula and below the tip of each scapula and in each axilla.

On auscultation you are listening for the **quality of breath sounds**, the **intensity of breath sounds** and **added sounds** (either a wheeze, crackle or pleural rub). Normal breath sounds are called vesicular breathing, they are louder and longer in inspiration. Bronchial breath sounds are areas of turbulent air flow (eg over an area of consolidation) so are often louder and longer in expiration. Reduced intensity breath sounds are due to impaired airflow arising from chronic obstructive airways disease, alveolar collapse (atelectasis), the presence of fluid or mucous or a pneumothorax.

A **wheeze** is a continuous sound in either inspiration, expiration or both. It is due to obstructed airflow (a high pitched wheeze is often associated with asthma while a low pitched wheeze is often associated with chronic obstructive airways disease).

**Crackles** are sometimes called creps or crepitations. They are interrupted added sounds and the actual sound depends on the underlying process. Fine crackles are often due to lung fibrosis (they sound like velcro separating), coarse creps are due to either fluid or secretions. It can be hard to differentiate interstitial pulmonary oedema from pneumonia.

A **pleural rub** sounds like squeaky rubber boots and is due to the two layers of inflamed pleura rubbing against each other.

### The Cardiovascular System

Before assessing the thoracic cavity look for other signs of cardiac function and disease. Look at the hands for signs of nicotine staining, clubbing and splinter haemorrhages. Feel the pulse. Look at the face for signs of anaemia, cyanosis and a malar flush. Assess the JVP.

### *Inspect*

Inspect the exposed chest for signs of scars, pacemakers or implantable defibrillators, medication patches and for a pulsatile apex beat. Scars include a large midline scar over the sternum (from a previous coronary artery bypass graft or valve repair), a small scar in the axilla from a mitral valve procedure, a scar under the clavicle suggesting a previous pacemaker or central line. Pacemakers and implantable defibrillators are small boxes, often palpable below the left clavicle.

### *Palpate*

Traditionally this was done to assess for cardiac function. It has been largely superseded by echocardiography which is more reliable. It has little role in emergency pre-hospital care. The areas palpated were the Apex beat (usually in the 5<sup>th</sup> intercostal space in the mid-clavicular line), to the left of the sternum and in the 2<sup>nd</sup> intercostal spaces on the right and left.

### *Percuss*

Again, this skill is largely redundant but originally was used to assess the size of the heart.

### *Auscultate*

Both the diaphragm and bell are used to auscultate the heart. Auscultation provides information on the heart rate, the flow of blood across the valves (abnormalities are referred to as murmurs), heart function (abnormalities are referred to as S3 and S4 added sounds) and for damage to the pericardial sac.

The heart has four sounds but generally only the first and second heart sounds are heard. This gives the classic lub-dub (S1, S2) sound. The lub represents systole (S1) or the beginning of ventricular contraction when the mitral and tricuspid valves close. The dub represents the end of systole and the start of ventricular diastole or relaxation (S2) when the aortic and pulmonary valves close. The rate is easily calculated by counting the number of lub-dubs in a minute.

Valve abnormalities are important to detect, although not necessarily in a pre-hospital setting. Turbulent flow arises because either the valve is thickened, doesn't open properly and reduces the volume of blood flowing through (this is referred to as stenosis) or because the valve leaflets are floppy, do not close properly and blood flows back through them (this is referred to as incompetence or regurgitation). Generally auscultate in all 4 areas indicated in the table below with the diaphragm of the stethoscope. Two murmurs are best picked up with the bell; mitral stenosis which is a diastolic (S2) murmur and aortic incompetence which is also a diastolic murmur (S2). Congenital heart disease results in complex murmurs heard throughout systole and diastole.

	Left sided heart valves		Right sided heart valves	
	Mitral Valve	Aortic Valve	Tricuspid Valve	Pulmonary Valve
Best heard	5 <sup>th</sup> ICS, Left mid-clavicular line	2nd ICS, Right of sternum	4 <sup>th</sup> ICS, Left of Sternum	2 <sup>nd</sup> ICS, Left of Sternum
Stenosis	Diastolic Murmur	Systolic Murmur	Diastolic Murmur	Systolic Murmur
Incompetence	Systolic Murmur	Diastolic Murmur	Systolic Murmur	Diastolic Murmur

Additional heart sounds, referred to as S3 and S4 sounds, are hard to hear. A S4 or 4<sup>th</sup> heart sound is often due to hypertension while a S3 or 3<sup>rd</sup> heart sound often occurs in left ventricular failure.

Fluid in the pericardial sac (pericardial effusion or pericardial tamponade) affects the heart's ability to contract and relax and creates muffled heart sounds, that is, sounds that are difficult to hear.

Inflammation of the pericardium lining the heart creates a pericardial rub which has been described as walking on frosty ground.

## 2.6 Abdomen and Pelvis

The Abdomen and Pelvis are best examined with the patient lying flat and exposed (when practical) from just below the nipples to the pubic symphysis. Again, the principles of inspect, palpate, percuss and auscultate apply. It is important to assess the patient for signs of systemic disease affecting the general appearance, hands, head and neck.

### *Inspect*

Look carefully in all areas, including the flanks at the side, the groin and the back for signs of scarring, discolouration, distension, movement with respiration, stomas, prominent veins, pulsations and additional tubing (eg a PEG tube or dialysis catheter).

### *Palpate*

The abdomen may be divided into either 4 (2x2) or 9 (3x3) quadrants for palpation. The 4 quadrants are referred to as the right upper quadrant (RUQ), the left upper quadrant (LUQ), the right lower quadrant (RLQ) and left lower quadrant (LLQ). The 9 quadrants are referred to as the right hypochondrium, the epigastrium, the left hypochondrium, the left lumbar area (or flank), the left iliac fossa (LIF), the hypogastrium (or supra-pubic area), the right iliac fossa (RIF), the right lumbar area (or flank) and the umbilical area. These terms are often inter-changed.

There are two stages to palpation:

1. Superficial palpation; to elicit tenderness, guarding (voluntary or involuntary), rigidity and rebound tenderness.
2. Deep palpation; to assess for masses and organomegaly.

To palpate the abdomen, position yourself level with the patient and so that you can see their face. Start with one hand for superficial palpation and lightly but firmly place the heel of your hand and then fingers onto the patient's abdomen. Two hands may be used for deep palpation.

The following organs can be felt in the abdomen; the liver, the spleen and the kidneys. A pulsatile aorta may also be palpable.

### *Percuss*

Percussion is used to establish 1) liver enlargement and 2) if there is fluid in the abdomen. The same technique as in the respiratory exam is employed.

### *Auscultate*

Auscultation is performed to assess for bowel sounds. Listen in one area for up to 20-30 seconds before declaring that they are absent. Absent bowel sounds occur in shock or ileus. Increased bowel sounds can suggest bowel obstruction.

## 2.7 The legs

Expose the legs and look for signs of deformity, asymmetry, muscle wasting, bruising or foreign bodies. Look for signs of infection or inflammation; swelling, redness, increased temperature and tenderness. Examine the calves for tenderness, hardness and swelling (possible markers of a deep venous thrombosis). Check over the pre-tibial area for pitting oedema by applying a firm pressure with your thumb for 5 seconds.

## 2.8 The Back

Whenever practical try to assess both sides of the patient as significant injury may be missed. Look for signs of any swelling, bruising or deformity. Any discoloration? Palpate over the ribs for tenderness, flail segments and sub-cutaneous emphysema. Palpate over the renal angles for tenderness.

## 2.9 Neurological System

This is a very complex area and a detailed examination is outside the remit of the pre-hospital practitioner.

The most important factors are to note

- 1) In cases of suspected spinal injury are there any areas of weakness or altered sensation. Ask the patient to move their fingers and toes as a crude screening test. Ask them can they feel you touch their hands and feet.
- 2) In the case of suspected stroke, perform a FAST test looking for facial symmetry, arm drift and a speech abnormality.
- 3) Assess for any motor or sensory deficits associated with an injury, that is, if there is a weakness of any muscle group or an area of altered sensation.
- 4) Check for pupil size and reaction in any case of a reduced level of consciousness or any history suggestive of brain injury or drug ingestion.