Topic Overview: Professional Entry Critical Care
Sub-Module: U2 – Chest Pain and Shortness of Breath
[Last Updated August 2013]

This handout is designed to partner the topic overview simulation session U2: Chest Pain and Shortness of Breath. This session involves a presentation, followed by a simulated scenario. Use this document to jog your memory or to aid in your reflection of the session, and the simulation.

We are targeting "higher level learning". This is the application of skills and knowledge within a contextualised event to, hopefully, improve performance and practice. Learning is further encouraged through discussion and also working through simulated scenarios. This session is also designed to allow you to put into practice knowledge and skills attained from this session and other learning environments (other EdWISE cardiac sessions, any associated eLearning, clinical placements, etc.).

As clinicians we should be constantly reviewing our own practices and looking for current best practice standards. During the feedback sessions we will facilitate this reflection but we would also encourage you to reflect on your experience in this session and think about any improvements that could be made to your own practice, the practice of your team or department or to any systems that you work within. Reviewing this handout may help you to do this.

Introduction
Chest pain and shortness of breath are two of the most common symptoms that patients complain of both on presentation to the Emergency Department and also as inpatients on the ward. This module will describe a structured approach to these patients including: initial assessment; early investigations; differential diagnosis and initial management.

Objectives for this module
- Describe a structured approach in relation to patients with chest pain and/or shortness of breath (SOB)
- Outline initial assessment of patients with chest pain and SOB
- Rationalise investigations to perform on individual patients within this patient population
- Provide a framework for thinking about potential differential diagnoses
- Discuss initial management options for some of the more common and/or serious diseases
- Look at the importance of communication, multidisciplinary teamwork, escalating concerns and handover when treating this patient population

Initial Assessment & Approach
The initial approach to the patient will be the same as for any critically unwell patient - DRS ABCDE (DEFG).

D - Danger

Is there any danger to you, your staff or the patient?

R - Response

Is the patient responsive? Do they respond to your arrival to their bedside? Ask them a question!

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S - Shout for Help

Think about help at this stage. Although it may not be appropriate to shout for help with every critically ill patient that you see, it is worth thinking about your need for help with every patient that you see. This will make it less likely that you forget this vital step when you are in need! It is also important to think about the likely journey that this patient will take. If they are likely to be suffering with a stroke or trauma - does your hospital have the appropriate skills and team available 24 hours? Is it likely that you are going to need to mobilise retrieval or specialist help? If so think of these early so that they are mobilised as early as possible.

A – Airway

Does the patient have an open and protected airway? If the patient is able to speak to you coherently and there are no added or abnormal sounds of breathing, then the likelihood is that they do. Ask the patient a question! If the patient is obtunded then airway opening manoeuvers may need to be attempted whilst help arrives. Oxygen can also be applied at this time via a non-rebreathing mask. If you are supporting the patient's airway you will require other members of the team to complete the initial assessment of the patient.

B - Breathing

- Look - Are they breathing or trying to breathe? Is the chest expanding well and symmetrically? Are there any lumps, bumps, rashes, defects on the chest wall (remember that there is a front, a back and two sides to the chest)? Is the patient exerting themselves to breathe? Is there intercostal recession or tracheal tug? Are they sat upright gasping for breath and unable to answer your questions? What colour is the patient? Do they look pink and healthy, or blue, or grey? What is their respiratory rate? How does this compare to their previously charted rates?
- Listen - Can you hear any abnormal sounds of breathing from the bedside - wheeze, stridor, grunting, coughing, other? Now its time for your stethoscope. Remember to listen to the front, back and sides and compare left with right.
- Feel - Palpate the chest for lumps, bumps, rashes, deformity and tenderness. You may also be able to feel rubs, thrills, heaves or surgical emphysema.
- Monitoring - A saturation probe can give you information about the patient's oxygenation and often the heart rate and rhythm. A good waveform may also indicate a decent perfusion pressure to that finger/ear. The saturation probe does not indicate the adequacy of ventilation so cannot tell us about the patient's carbon dioxide level.

C - Circulation

- Look - What does the patient's skin look like? Are they flushed, pale, mottled, peripherally cyanosed? Are there any obvious sites of fluid loss - urine in catheter bag, vomit bowls, suction, input/output charts or blood? Are there any indications of fluid replacement or circulatory support - IV fluids, blood, syringe drivers containing drugs acting upon the cadiovascular system? Does the patient have pitting oedema of dependent areas? Is this due to right sided heart failure? Is their JVP normal? Looking at their hands are there signs of endocarditis or tar staining from cigarette smoking? Xanthomata may also indicate high levels of cholesterol and associated pathology.
- Listen - Auscultating the precordium can give you some vital clues - rhythm, rate, murmurs, clicks, pericardial rubs. You may also be able to hear crackles at the bases of the lungs that may indicate left ventricular failure.

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- Feel - Feeling the temperature of the patient's hands and feet can give an indication of distal perfusion. You can compare central capillary refill times to peripheral. Feel for pitting oedema and for calf tenderness. Palpating peripheral pulses is also important. This can give an indication of rhythm, rate, pulse pressure and character. You should also compare the pulse pressures in the peripheral pulses, you may be able to diagnose an aortic dissection! Absent pulses may be due to poor or obstructed vasculature or a low perfusion pressure. Palpating the liver may also give an indication of right sided heart failure if it is enlarged and/or pulsatile.
- Monitoring can also give valuable information. The monitoring available will vary as to where the patient is and the appropriate monitors will be determined by the patient's illness. Saturation monitoring can give valuable information on heart rate and rhythm. This can be supplemented by 3 or 5 lead ECG and non-invasive blood pressure monitoring. Invasive monitoring may be available in some critical care areas. Information from these devices can be invaluable but should always been reviewed in the context of that particular patient and also the vital sign trends.

D - Disability

By the time you assess disability you may have a good idea of the patient's conscious level. If they are able to answer a question appropriately then they are likely to have an open airway with some amount of ventilation and perfusion to allow the delivery of oxygen and blood and glucose to the brain. It also means that the brain is functioning at a relatively good level. If the patient seems confused or obtunded then a more thorough investigation of the nervous system is required.

The use of the AVPU scale (Alert, Voice, Pain, Unresponsive) can give an indication to the patient's conscious level. A score of P or U should be a cause for concern. The Glasgow Coma Scale is a more in-depth assessment. It is made up of 3 categories - Eye response, Verbal response, Motor response it is scored from 3-15 with a score of 15 being normal and 3 meaning that the patient is completely unresponsive.

If the patient is able to obey commands it is often worth asking them to move each of their limbs in turn. This may indicate a weakness or paralysis of a muscle group or limb. Look for asymmetry in the face, body and limbs. If an abnormality is found then assessment of tone/reflexes/power and sensation are important additions to the examination. Patients with focal neurology should be assessed quickly and thoroughly so that a likely site of the pathology can be found and treated. If the patient has signs and symptoms suggestive of a stroke, early imaging and then treatment as required is vital to decrease loss of brain cells. This can make a huge difference to the patient's end quality of life.

Glasgow Coma Scale

Eye Scores
4 - Eyes open
3 - Eyes open to voice
2 - Eyes open to pain
1 - Eyes do not open to any stimulus

Verbal Scores
5 - Normal verbal response, orientated
4 - Confused speech
3 - Random words
2 - Incoherent words
1 - No verbal response

Motor Scores
6 - Obeys commands (e.g. touches nose if asked)
5 - Localises to painful stimulus (Classically this should be a painful stimulus above the clavicles. If the patient is able to move the hands above the level of the clavicles in response to the stimulus then they are localising to pain. A good jaw thrust is a good stimulus and will also help to open the patient's airway!)
4 - Flexes or withdraws to pain. Patient tries to move hand/finger when nail bed is compressed
3 - Abnormal flexion in response to pain. Flexor posturing; adduction of arm, internal rotation of shoulder, pronation of forearm, flexion of wrist. This is a decorticate response
2 - Extension in response to pain. Extensor posturing; external rotation of shoulder, supination of forearm, extension of wrist. This is a decerebrate response
1 - No motor response to pain.

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Check the pupils for symmetry, size and response to light. Fundoscopy may give an indication of raised intracranial pressure or stigmata of disease (e.g. poorly controlled diabetes).

In every critically unwell patient check a blood sugar level **D**on't **E**ver **F**orget **G**lucose (**DEFG**). This is especially important in those with an altered LOC. Both hypo and hyperglycaemia can cause altered mental states and even coma.

E - Exposure

With explanation to the patient and consideration for their dignity, expose the patient so that you can inspect all areas of their body. Looking for rashes, bumps, bruises, trauma, bleeding, drains, vascular access, etc. It is then important to cover the patient to maintain body heat and also dignity.

The DRS ABCDE (DEFG), with practice and good teamwork, should only take a few minutes. Any life threatening conditions should be identified and treated during this time. If anything potentially life threatening is seen, remember to call for help. A structured, thorough, team approach is what is needed for all critically ill patients!

History

During the initial assessment it is often possible to take a concise history from the patient this should include an AMPLE history.

- Allergies
- Medications:
- Previous Medical History
- Last time the patient ate or drank
- Event (back ground to presentation).
    - This may include a description of the onset of symptoms, exacerbating/relieving factors, treatment taken, similar episodes in the past, description of any pain - site, severity, radiation, exacerbation or relief, character and any associated symptoms

Aetiology of Chest Pain

Chest pain can be caused by a number of pathologies and can be associated with many other symptoms especially shortness of breath. The causes can be acutely life threatening or relatively benign. Some common or serious causes of chest pain are listed below. The diagnoses below tend to have chest pain as the main complaint. Despite this many patients will also complain of SOB. This may be because the cause of the pain is also affecting the respiratory system (e.g. coronary artery disease leading to pulmonary oedema) or the pain itself causing a tachypnoea.

- Cardiac
    - Coronary artery disease
    - Aortic dissection
    - Pericarditis
- Gastrointestinal
    - Oesophageal disorders (reflux or spasm)
    - Peptic ulcer disease
    - Biliary colic or cholecystitis
    - Pancreatitis

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- Musculoskeletal
    - Costochondritis
    - Trauma
    - Malignancy
    - Zoster or post-herpetic neuralgia
- Psychogenic
    - Anxiety or panic disorders
- Other causes tend to have a respiratory component associated with the disease. This will cause the patient to complain of breathing difficulties as well as chest pain.

As stated above, some of the causes of chest pain can be acutely life threatening. Because of this we must quickly assess the patients and attempt to rule in and treat these life-threatening conditions or try to exclude them. To adequately achieve this requires a multi professional team approach. In the ED most patients with chest pain are triaged as a category 2 patient and are assessed within 10 minutes of triage. The assessment will include the DRS ABCDE approach, described above, as well as a 12 lead ECG. Depending upon the history, presentation and assessment the patient may also benefit from: oxygen, cardio-respiratory monitoring and intravenous access with blood taken for laboratory testing, chest x-ray and analgesia.

Blood tests may include cardiac markers (usually Troponin, but may include creatinine kinase MB), urea and electrolytes (looking for renal function and electrolyte derangement which may lead to chest pain causing arrhythmias), full blood count (anaemia can cause cardiac ischaemia), liver function tests (may rule in or out a hepatobiliary cause of the pain), amylase and lipase (looking for pancreatitis). If the patient is in a critical care area a venous or arterial blood gas may be able to give some results faster than the laboratory results.

A chest x-ray may be useful to detect a widened mediastinum in aortic dissection, cardiomegaly or trauma as causes for the pain. It can also be used to diagnose pulmonary oedema, which may have a cardiac cause.

The ECG is one of the most important investigations in chest pain. It is used to diagnose myocardial ischaemia and/or infarction. As mentioned above, in NSW, patients presenting to the ED with chest pain should be triaged as a category 2 patient. They should have a 12 lead ECG with expert analysis within 10 minutes of the triage. Cardiac disease is a major cause of morbidity and mortality in Australia and it is important to diagnose and treat cardiac causes of chest pain quickly and accurately. The NSW chest pain pathway can be accessed here (http://www0.health.nsw.gov.au/policies/pd/2011/pdf/pd2011_037.pdf). An old ECG is invaluable so that comparison can be made with the new ECG. ECG changes that are indicate a myocardial infarction should be sought so that treatment can be initiated as soon as possible.

The classic ECG changes are:

- 1mm, or more, of ST elevation in two contiguous limb leads
- 2mm, or more, of ST elevation in two contiguous chest leads
- Presumed new onset left bundle branch block (LBBB)

Diagnosis of a myocardial infarction can be made with the help of a convincing history (central crushing chest pain which may be associated with radiation to the jaw/arm/neck, or nausea or shortness of breath. Associated family history and high risk patient attributes also increases the risk). It is important to remember that many episodes of acute coronary syndrome and even myocardial infarction present in an atypical fashion. This can happen in any population group but we need to be especially vigilant with the following groups; females, diabetics, patients with

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renal failure, the elderly and aboriginals. Obviously obtunded or confused patients may not be able to describe chest pain either. Many a car crash has occurred because of a myocardial infarction behind the wheel!

Myocardial biochemical markers are increasingly being used to aid the diagnosis of myocardial damage and infarction. The assessment of these markers is being continually improved with higher sensitivity and specificity being achieved. Most hospitals within NSW use one of the cardiac troponin assays as the enzyme of choice. Troponin I and T are found attached to the actin-myosin complex in heart muscle where as Troponin C is found in skeletal muscle. Troponin I and T are released when cardiac muscle dies and a significant level can be measured between 3 and 6 hours after an infarct. Levels peak around 18 hours after injury and normalises over the next 14 days. Different hospitals will have different protocols for timing of blood samples and these should be followed. Creatinine Kinase MB was used previously but has been largely replaced by Troponin due to its greater specificity and sensitivity. Some sites may still use creatinine, especially in second and third world countries.

Patients with confirmed myocardial infarction require reperfusion therapy. The type of reperfusion therapy will depend upon the hospital. Those sites that are able to offer 24hr primary percutaneous cardiac intervention (PCI) - should have this as their minimum standard of care for patients with a ST segment elevation myocardial infarction (STEMI). Those sites that are not able to offer this service should use thrombolysis as their primary reperfusion therapy. There may be some exceptions to this, especially where there are good transfer arrangements to allow access to primary PCI.

Diagnosis and management of a STEMI is relatively easy. There are criteria and protocols and guidelines to follow. For those patients who do not have ECG changes but have a convincing history with or without a Troponin rise it is somewhat more difficult. Fortunately there is some help from NSW health in the form of the NSW chest pain pathway. The pathway offers guidance on risk stratification and the further management of these patients. Importantly it also emphasises that not all chest pain is cardiac and it is important to rule out other life threatening causes of chest pain, such as aortic dissection, pericarditis and pulmonary embolus [1].

Here are some examples of high, intermediate and low risk features.

High Risk	Intermediate Risk	Low Risk
Elevated Troponin	Known coronary artery disease	Clinical features of ACS without any intermediate or high-risk features
Repetitive or prolonged ACS symptoms	Age greater than 65 years	
Haemodynamic compromise	Two or more risk factors (smoking, hypertension, etc)	
Diabetes or chronic renal failure with typical ACS symptoms	Diabetes or chronic renal failure with atypical ACS symptoms	

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Management of patients with ACS will depend upon the individual patient as well as their presentation. It may include antiplatelet therapy, beta-blocker, anticoagulants and exercise stress testing. If you are at all unsure then discussion with your seniors and/or seeking cardiological advice is appropriate.

Chest Pain with associated Respiratory Symptoms

Many patients with chest pain will also complain of some respiratory symptoms. One of the most common symptoms is SOB, one of the most common signs is tachypnea. Changes in respiratory rate are one of the most sensitive signs of physiological change in our patients. It is not very specific towards a cause but it is ***very*** sensitive. These respiratory symptoms and signs can help us to generate likely differential diagnoses.

As well as cardiac chest pain (dull, heavy, not affected by breathing) another common type of chest pain is pleuritic. Pleuritic chest pain tends to be "sharp" and "stabbing" and exacerbated by breathing or breathing deeply. It may be well localised or quite diffuse. Even though this pain is less likely to be cardiac, many of these patients should still be assessed expeditiously as some causes can be life threatening. In ED many would still be triaged as category 2 patients. A 12 lead ECG should also be completed quickly and assessed by an expert practitioner. The reason for this is because some people with chest pain with a cardiac origin will present atypically and also ECGs may be of diagnostic benefit in other disease processes.

Assessment will follow the same structure as previously with a thorough DRS ABCDE approach with appropriate monitoring and investigations. Some potential diagnoses for patients presenting with pleuritic sounding chest pain as listed below.

- Respiratory
  - Pneumonia
  - Pneumothorax
  - Pulmonary embolus or infarction
  - Viral pleurisy
- Cardiac
  - Pericarditis
  - Atypical presentation of ACS or myocardial infarction
- Musculoskeletal
  - Fractured ribs or other trauma
  - Costochondritis
  - Malignancy
- Psychogenic
  - Anxiety or panic disorders

Depending upon the history and the examination findings, investigations that could be considered include: blood sampling for urea and electrolytes; full blood count; LFTs; d-Dimer; blood gas analysis; chest x-ray and a 12 lead ECG.

A chest x-ray will help to diagnose or exclude a pnuemothorax, a pneumonia or trauma as a cause for the pain.

An ECG may be useful to diagnose a cardiac cause for the pain. Some patients with a pulmonary embolus may also have ECG changes, including signs of right heart strain, sinus tachycardia or the "famous" S1, Q3, T3.

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The FBC, LFTs, renal function tests and electrolytes may point to the presenting pathology or diagnose other systemic illnesses that may affect the presenting pathology. They can also be used as a baseline if there are further changes in the patient.

Arterial blood gases will give the practitioner information about the patient's ventilation and gas exchange. This can point towards the diagnosis or the respiratory consequences of the the disease.

d-Dimers are cross-linked breakdown fragments of fibrin. They are very good indicators of fibrinolytic activity. They are not specific for any particular disease process but the laboratory test is very sensitive for the breakdown of fibrin. This test can be used to exclude PE as a cause of pleuritic chest pain in patients with low risk of venous thromboembolism. In patients with high probability of PE a computed tomography pulmonary angiogram (CTPA) or ventilation perfusion scan may be more appropriate. The British Thoracic Society recommends following the NICE guideline, GC144. Here the 2-level PE Wells score and the 2-level DVT Wells score are used to help decision making on appropriate investigation for patients with suspected PE and/or DVT.

Information on the risk stratification for DVT and PE can be found here

http://publications.nice.org.uk/venous-thromboembolic-diseases-the-management-of-venous-thromboembolic-disease-and-the-role-of-cg144/key-priorities-for-implementation

Well's score for PE - The 2 level PE Wells score can be used to estimate the clinical probability of PE. If a patient scores more than 4 points, PE is clinically likely. If the patient scores 4 points or less, PE is unlikely [2].

- Patients suspected of having a PE and a "likely" 2-level PE Wells score should be offered an immediate CTPA or parenteral anticoagulation until a CTPA can be organised [2].
- The patients with an "unlikely" score are offered a D-dimer test. If positive the patient should then be offered a CTPA as above. If the patient is allergic to IV contrast, suffers with renal impairment or have a high risk associated with irradiation - consideration should be given to a ventilation/perfusion scan.

Well's score for DVT - The 2 level DVT Wells score can be used in a similar fashion to estimate the clinical probability of a DVT. The score uses a variety of clinical variables that are scored. If the score is 2 or more, DVT is likely. If the score is 1 or less, DVT is unlikely [2].

- In patients suspected to have a DVT and their Wells score is 2 or more (DVT likely) a proximal leg ultrasound is recommended. If this is negative then a D-dimer should be checked. If an ultrasound cannot be organised within 4 hours the patient should have blood taken for D-dimer levels and receive parenteral anticoagulation (usually a low molecular weight heparin - LMWH) before undergoing an ultrasound within 24 hours.
- If the patient's Wells score is 1 or less, they should be offered a D-dimer test. If positive a proximal leg vein ultrasound scan should be organised within 4 hours or within 24 hours giving the patient parenteral anticoagulation [2].

Treatment for an acute Pulmonary Embolus may include Oxygen, IV access and fluids, analgesia, anticoagulation and possibly thrombolysis. Many hospitals will have guidelines for the investigation of suspected PE and DVT with an associated management plan. You will find the British Thoracic Society's recommendations here - http://publications.nice.org.uk/venous-thromboembolic-diseases-the-management-of-venous-thromboembolic-diseases-and-the-role-of-cg144/key-priorities-for-implementation

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Initial management of any patient with chest pain associated with respiratory signs or symptoms should include consideration of oxygen, cardio-respiratory monitoring, IV access with blood taken for testing. It is also worth considering IV fluid (a high respiratory rate can lead to dehydration, especially when coupled with a pyrexia!) and analgesia. Analgesia for these patients may include paracetamol, NSAIDs, narcotics and positioning.

Patients with spontaneous pneumothoraces may benefit from an intercostal catheter or chest drain, as well as the above therapies. For a simple pneumothorax a relatively small bore catheter inserted via the Seldinger technique is usually sufficient to resolve the pneumothorax. Chest x-ray confirmation of positioning is important. Patients at particular risk of spontaneous pneumothorax include tall, thin males; asthmatics and those with a previous history of spontaneous pneumothorax.

Shortness of Breath

As with chest pain, shortness of breath is a common presentation seen both on the wards and in the ED. Causes can be acutely life threatening - asthma, anaphylaxis and pneumonia - or benign. These three life threatening conditions will be covered below. As with any critically unwell patient patients presenting with breathlessness should be assessed with a DRS ABCDE structure.

- Initial assessment, investigation and life saving management should be swift and concurrent. For the critically ill this should involve a multidisciplinary team with senior assistance as appropriate.
- Special attention should be paid to the examination of the respiratory system. Inspection, palpation and auscultation should be thorough and should be repeated. Saturation monitoring should be continuous throughout the episode and consideration given to cardiac monitoring.
    - Inspection for chest wall defects/rashes/symmetry/discolouration/jugular venous engorgement/expansion/work of breathing and respiratory rate are all vital.
    - Palpation of the chest wall can help determine equal and adequate expansion. It may also point to areas of trauma, infection and can help to determine the aetiology of a rash.
    - Auscultation should be thorough and comparing the same area on the left and right. The back, front and sides should all be auscultated. Breath sounds may be vesicular or bronchial and added sounds may include wheeze, crackles, crepitations and rubs. Auscultation can also be useful to assess air entry to the various lobes of the lungs.

Investigations for the breathless patient may include:

- **Blood tests**
    - FBC white cell count for infection - Hb for anaemia, platelets as a sign of inflammation or marrow suppression.
    - Urea and electrolytes - urea for signs of dehydration from infection/pyrexia/tachypnoea (may also be needed for CURB score), electrolyte imbalance,
    - CRP - as a test for inflammation. Non specific but can also be used to gauge response to therapy.
    - Arterial Blood Gas - A useful test to look at the acid/base balance as well as adequacy of ventilation. Some ABG machines will also give quick results for haemoglobin/electrolytes and lactate
    - Lactate - Increasing lactate is a sign of anaerobic respiration in some of the body's cells. This may be due to low perfusion due to sepsis, for example.
- **Peak Flow** - This is a very useful bedside test, especially in asthmatic patients. It can be used to grade severity of an asthma attack as well as monitor the patient's progress.

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- **Chest X-Ray** - Useful to assess for lung parenchymal disease, for pneumothorax, trauma, infection and masses.
- **ECG** - Used to investigate cardiac causes of breathlessness including arrhythmias and ischaemic heart disease. Certain changes may also be seen in patients with pulmonary embolus.

Asthma

Asthma is still a fatal disease. Severe exacerbations are time critical and are extremely stressful for the patient, their family and even the treating the team. The classic presentation will involve a patient who is breathless and on auscultation has an audible expiratory wheeze with reduced air entry. **Beware the silent chest or absent wheeze!** This may be due to very severe airway constriction leading to little or no air flow and so little or not noise.

Assessment should follow the above DRS ABCDE approach. Patients with severe, life threatening or near fatal asthma will have difficulty finishing sentences within one breath. It is important to focus your history taking and ask more closed or one words answer questions! Classification of asthma severity is useful and can aid communication with team members, colleagues and seniors [3].

Moderate Exacerbation	**Acute Severe (Any one of)**	**Life Threatening (Acute Severe Asthma plus one of)**	**Near Fatal**
Increasing symptoms	Respiratory rate ≥ 25/min	PEF ≤ 33% of best or predicted	
Peak Expiratory Flow Rate (PEF) 50-75% of best or predicted	PEF 33-50% of best or predicted	SpO_2 < 92% PaO < 8kPa Normal $PaCO_2$ (4.6-6.0 kPa)	Raised $PaCO_2$ when usually normal
No features of acute severe asthma	Heart rate ≥ 110/min	Silent Chest	
	Inability to complete sentences in one breath	Cyanosis	Requiring ventilation with raised inflation pressures
		Poor respiratory effort	
		Arrhythmia	
		Exhaustion	
		Altered conscious level	

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As you can see above, Peak Flow can elicit useful information that can be used to guide therapy and need for escalation of treatment and/or monitoring.

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Treatment

Treatment should begin as soon as an acute exacerbation of asthma is detected.

- Oxygen should be given to maintain sats above 94%. If pulse oximetry is not available then oxygen should be given.
- First line agent is a nebulised β_2 agonist (such as salbutamol). An adult dose is 5mg and can be repeated to "continuous nebulisation".
- Nebulisers should be oxygen driven.
- Steroids should be given to all patients with acute asthma attacks. There is no difference in efficacy between IV and enteral steroids. Patients should receive 40-50mg/day of prednisolone, or an IV equivalent, for at least 5 days. If the course is less that 7 days the steroids can be stopped without any decrease [3].
- Nebulised ipatropium bromide is to be administered to patients with acute severe or life threatening asthma. It should also be given to patients who have a poor response to β_2 agonist therapy, with moderate or mild asthma.
- Patients with life threatening of near fatal asthma, magnesium can be given IV. A dose of 1.2-2gm over 20 minutes as a single infusion [3].
- It is important to consider early referral to intensive care. Warning signs include - drowsiness, worsening peak flow despite treatment and hypercapnia.

Most patients with an acute severe attack, or worse, will be admitted to hospital for observation. It is important that a senior respiratory physician follows up these patients. The British Thoracic Society's guidelines can be accessed here - http://www.brit-thoracic.org.uk/Portals/0/Guidelines/AsthmaGuidelines/qrg101%202011.pdf

Anaphylaxis

The terminology surrounding anaphylaxis is confusing and is different around the world. In Europe the European Academy of Allergology and Clinical Immunology nomenclature (EAACI) is followed.

> *"Anaphylaxis is a severe, life-threatening, generalized or systemic hypersensitivity reaction".*

It is subdivided into two categories: allergic and non-allergic.

- Allergic - mediated by an immunological mechanism (IgE, IgG, complement)
- Non-allergic - not mediated by an immunological mechanism

North America uses the terms anaphylaxis and anaphylactoid.

- Anaphylaxis - IgE mediated reaction
- Anaphylactoid - Not IgE mediated

In the acute setting the terminology does not matter. They will be clinically indistinguishable and require the same treatment, urgently!

Assessment and initial life-saving management will follow the DRS ABCDE approach. Features in the history may include; rapid onset, history of allergy, previous atopy or asthma.

Clinical features to look for (most common first)[4]

- Rash or other skin signs - seen in most cases of anaphylactic reaction

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- Cardiovascular collapse
- Bronchospasm
- Hypotension
- Angioedema

The treatment of any anaphylactic reaction is adrenaline. This can be given IV or IM. The IV dose is titrated to effect and given in small aliquot (50µg or 0.5ml of 1:10000 adrenaline at a time). The IM dose is 500µg into a large muscle group, repeated every 5 min as required. If repeated doses of adrenaline are required then an adrenaline infusion should be considered.

Whilst the adrenaline is being prepared and administered other members of the team should be assessing and securing the airway. High flow oxygen should be given. Early intubation may be required if angioedema/airway swelling is a feature. If bronchospasm is noted, a salbutamol infusion can be started or inhaled salbutamol given. Steroids can be considered. They will not help in the immediate acute situation but may decrease the risk of secondary collapse occurring. Again early senior help and ICU involvement is beneficial. Tryptase levels should be collected as soon as the patient is stable and repeated around 6 hours after the event [4].

Further information on the emergency treatment of anaphylaxis can be found on the Australian Resuscitation Council's website - http://www.resus.org.au/policy/guidelines/section_11/resuscitation_in_special_circumstances.htm

Pneumonia

In 2010, 1.6% of all reported deaths in Australia had pneumonia as a cause. It is more common in the elderly but can be deadly in any age group! Statistics on respiratory illness related deaths in Australia can be found here - http://www.abs.gov.au/ausstats/abs@.nsf/0/1CFA8B66386B6C04CA2579C6000F7030?opendocument [5]

Assessment of those acutely unwell from pneumonia will involve a multidisciplinary team approach in the DRS ABCDE manner. Presentations vary but most will have signs and symptoms of breathlessness. Patient may also complain of chest pain. These patients should be assessed as above and consideration given to a cardiovascular cause for the pain or the existence of both cardiac and respiratory pathology!

The British Thoracic Society state that community acquired pneumonia can be diagnosed in hospital when:

- The patient has signs and symptoms associated with an acute lower respiratory tract infection
- Radiographic changes for which there is no other explanation [5]

Investigations should include [6,7]

- Chest X-Ray
- Urea and Electrolytes - to aid severity scoring
- C-reactive Protein - to aid diagnosis (inflammatory marker) and to act as a baseline
- Full blood count
- Liver function tests
- For patients with moderate to severe pneumonia
    - Blood cultures - preferably prior to antibiotic administration. These should be repeated if the patient becomes pyrexial
    - Sputum cultures
    - Urine for Legionella and pneumococcal antigen testing
    - Mycoplasma can also be tested for in sputum and blood samples

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The severity of a patient's pneumonia should be assessed. This can give valuable information on likely mortality and guide decision making by the clinical team, the patient and their family.

CURB65 Score [6]	Total
C - Confusion **U - U**rea >7 mmol/l **R - R**espiratory Rate > 30/min **B - B**lood pressure (sys) < 90mmHg (dia) < 60mmHg **65 -** More than **65** years of age *Each of the 5 elements scores one point	0-1 - Treat as an outpatient (up to 3.2% mortality) 2-3 - Consider short hospital admission or closely supervised outpatient care (up to 17% mortality) 4-5 - Requires urgent hospital admission and intensive care input (mortality up to 57%) [8].

The Pneumonia Severity Index is another system that can be used to give clinicians and patients information about the severity of their illness and their possible mortality [9]. This tool has similar predictive power as the CURB 65 but requires many more data points to complete.

Management of patients with moderate to severe pneumonia may include

- Titrated oxygen to maintain oxygenation stats ≥ 94%
- IV antibiotics within 4 hours. See CIAP for up to date guidance on appropriate antibiotics. Note that first line antibiotic choice may change depending upon the location of the patient, recent microbiology trends and the patient's demographics. CIAP can be accessed here, if you have a username and password - http://www.ciap.health.nsw.gov.au/home.html
- Physiotherapy to improve mobilisation and specifically for chest exercises
- β_2 nebulisers may be useful to decrease any associated bronchoconstriction
- Saline nebulisers to aid expectoration
- Adequate hydration - patients may lose body water through high respirations and pyrexia
- Analgesia - care must be taken if the patient is requiring opiate analgesia. This may further diminish respiratory function[5,6]

For information on other areas of acute and emergency medicine please visit www.edwise.edu.au

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