Emergency in Allergy and Pulmonology

Allergic reactions emergency first aid

Symptoms of a severe allergic reaction include:

- difficult or noisy breathing
- swelling of the tongue
- swelling or tightness of the throat
- difficulty talking or a hoarse voice
- wheeze or persistent cough
- persistent dizziness or collapse
- paleness and floppiness in young children
- abdominal pain and vomiting.

Angioedema

Milder allergic symptoms that can appear before a severe allergic reaction include

- swelling of your lips, face and eyes
- hives or welts
- tingling mouth
- abdominal pain and vomiting.

Emergency first aid for severe allergic reactions

- Emergency responses for severe allergic reaction (anaphylaxis) are:

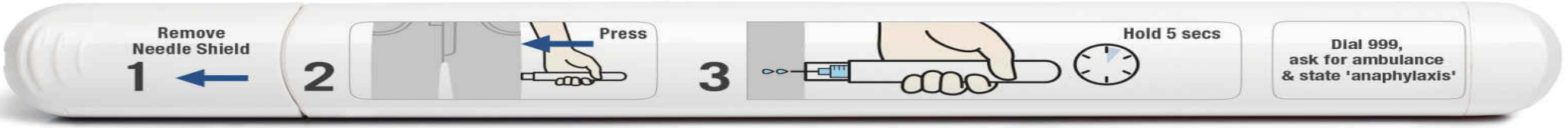
- lay the person flat – do not allow them to stand or walk
- administer adrenaline with an autoinjector (such as an EpiPen®)
- always dial triple zero (000) to call an ambulance in a medical emergency.

If you are at risk of a severe allergic reaction, make sure you:

- have a severe allergic reaction action plan
- carry a mobile phone to call for help when needed.
- carry an adrenaline autoinjector (e.g. EpiPen®) to treat a severe allergic reaction
- wear medical identification jewellery – this increases the likelihood that adrenaline will be administered in an emergency
- avoid medication (where possible) that may increase the severity of an allergic reaction or complicate its treatment – such as beta blockers
- avoid the known allergen where possible.

Adrenaline autoinjectors

- Adrenaline works fast to reverse a severe allergic reaction and adrenaline autoinjectors (EpiPens®)are designed for use by people who are not medically trained. If you are at risk, your doctor will have prescribed an adrenaline autoinjector.



Emergency first aid for asthma attacks

- Asthma can be well controlled with medication in most people. The main types of medication are:

- relievers that act quickly to relax the muscles around the airways – this is the medication used during an asthma attack
- preventers that slowly make the airways less sensitive to triggers and reduce inflammation inside the airways – they are taken daily to help keep you well
- combination therapies that are preventers containing two different medications.

The signs of an emergency include when the person:

- finds it very difficult to breathe
- is unable to speak comfortably or if their lips are turning blue
- has symptoms that get worse very quickly
- is getting little or no relief from their reliever inhaler.

While waiting for the ambulance, give four puffs of reliever medication every four minutes.

While waiting for the ambulance, give four puffs of reliever medication every four minutes.

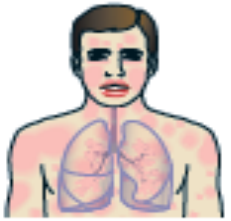
- If the person having the asthma attack (or sudden breathing difficulty) is known to have an allergy to food, insects or medication, always give the adrenaline autoinjector first, and then the asthma relief medication – even if there are no skin symptoms.

CLINICAL CRITERIA FOR DIAGNOSIS

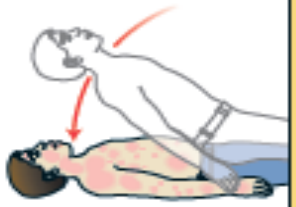
Anaphylaxis is highly likely when any one of the following three criteria is fulfilled:

1 Sudden onset of an illness (minutes to several hours), with involvement of the skin, mucosal tissue, or both (e.g. generalized hives, itching or flushing, swollen lips-tongue-uvula)

AND AT LEAST ONE OF THE FOLLOWING:



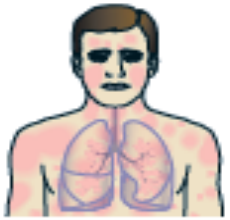
Sudden respiratory symptoms and signs (e.g. shortness of breath, wheeze, cough, stridor, hypoxemia)



Sudden reduced BP or symptoms of end-organ dysfunction (e.g. hypotonia [collapse], incontinence)

OR 2 Two or more of the following that occur suddenly after exposure to a *likely allergen or other trigger* for that patient* (minutes to several hours):

Sudden skin or mucosal symptoms and signs (e.g. generalized hives, itch-flush, swollen lips-tongue-uvula)



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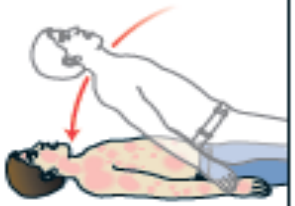

Sudden reduced BP or symptoms of end-organ dysfunction (e.g. hypotonia [collapse], incontinence)

Sudden gastrointestinal symptoms (e.g. crampy abdominal pain, vomiting)

OR 3 Reduced blood pressure (BP) after exposure to a *known allergen** for that patient* (minutes to several hours):

Infants and children: low systolic BP (age-specific) or greater than 30% decrease in systolic BP***

Adults: systolic BP of less than 90 mm Hg or greater than 30% decrease from that person's baseline

* For example, immunologic but IgE-independent, or non-immunologic (direct mast cell activation)

** For example, after an insect sting, reduced blood pressure might be the only manifestation of anaphylaxis; or, after allergen immunotherapy, generalized hives might be the only initial manifestation of anaphylaxis.

*** Low systolic blood pressure for children is defined as less than 70 mm Hg from 1 month to 1 year, less than (70 mm Hg + [2 x age]) from 1 to 10 years, and less than 90 mm Hg from 11 to 17 years. Normal heart rate ranges from 80–140 beats/minute at age 1-2 years; from 80–120 beats/minute at age 3 years; and from 70–115 beats/minute after age 3 years. In infants and children, respiratory compromise is more likely than hypotension or shock, and shock is more likely to be manifest initially by tachycardia than by hypotension.

INITIAL TREATMENT

1 **Have a written emergency protocol** for recognition and treatment of anaphylaxis and rehearse it regularly.

2 **Remove exposure to the trigger** if possible, eg. discontinue an intravenous diagnostic or therapeutic agent that seems to be triggering symptoms.

3

Assess the patient's circulation, airway, breathing, mental status, skin, and body weight (mass).

Promptly and simultaneously, perform steps 4, 5 and 6.

4

Call for help: resuscitation team (hospital) or emergency medical services (community) if available.

5

Inject epinephrine (adrenaline) intramuscularly in the mid-anterolateral aspect of the thigh, 0.01 mg/kg of a 1:1,000 (1 mg/mL) solution, maximum of 0.5 mg (adult) or 0.3 mg (child); **record the time of the dose and repeat it** in 5–15 minutes, if needed. Most patients respond to 1 or 2 doses.

6

Place patient on the back or in a position of comfort if there is respiratory distress and/or vomiting; **elevate the lower extremities**; fatality can occur within seconds if patient stands or sits suddenly.

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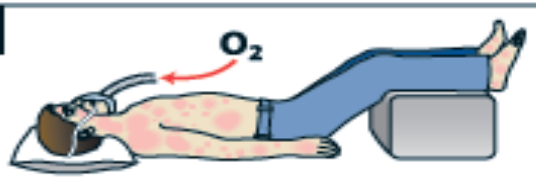

When indicated, give high-flow supplemental oxygen (6–8 L/minute), by face mask or oropharyngeal airway.

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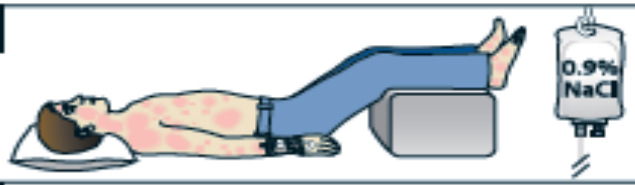

Establish intravenous access using needles or catheters with wide-bore cannulae (14 - 16 gauge). **When indicated, give 1-2 litres of 0.9% (isotonic) saline rapidly** (e.g. 5–10 mL/kg in the first 5–10 minutes to an adult; 10 mL/kg to a child).

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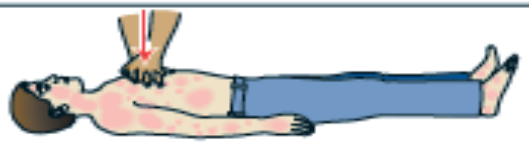

When indicated at any time, perform cardiopulmonary resuscitation with continuous chest compressions and rescue breathing.

In addition,

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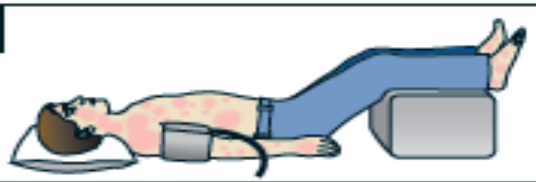
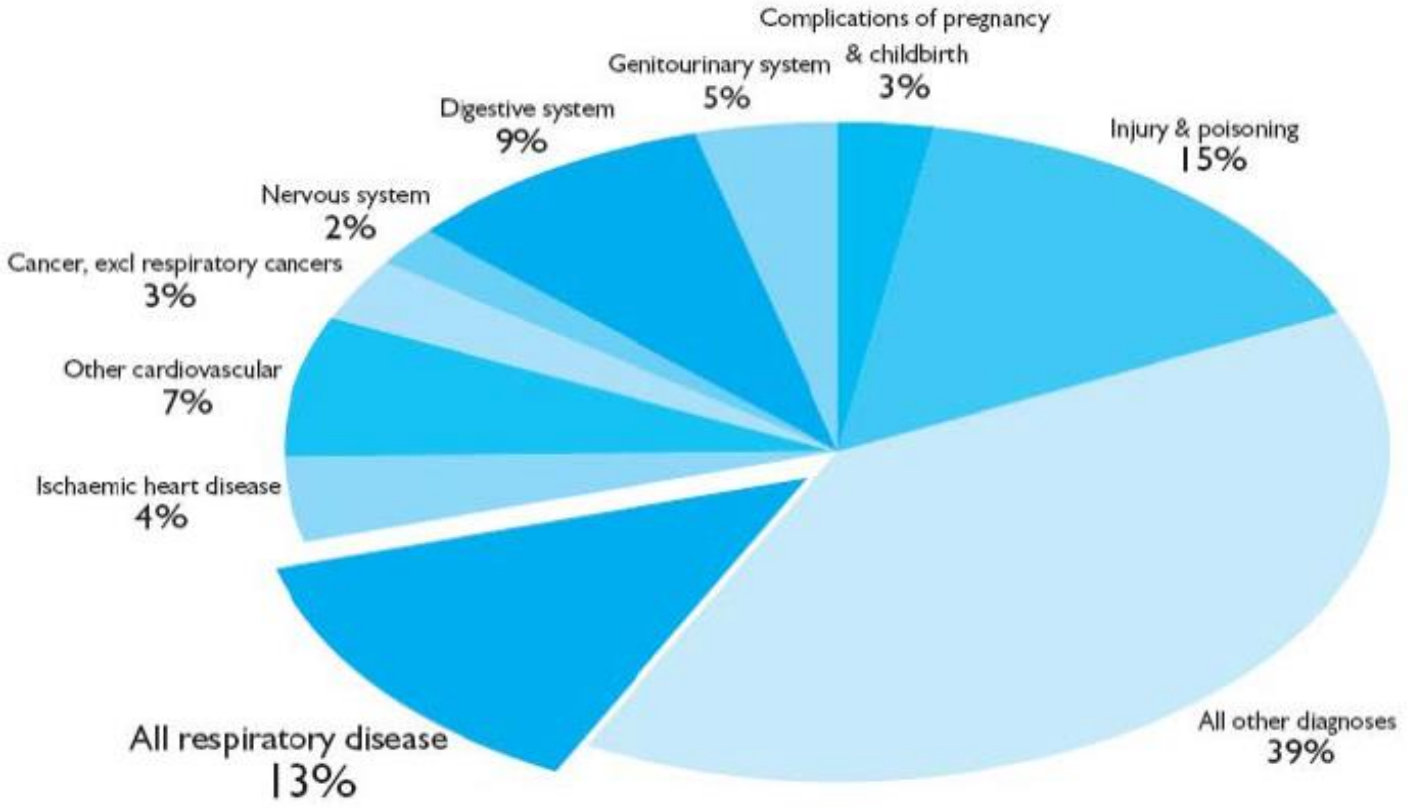


At frequent, regular intervals, monitor patient's blood pressure, cardiac rate and function, respiratory status, and oxygenation (monitor continuously, if possible).

References: Simons FER et al, for the *WAO. J Allergy Clin Immunol* 2011;127:587-93.e22 and *WAO Journal* 2011;4:13-36

Illustrator: Jacqueline Schaffer

Figure 3.2a Emergency admissions to English NHS hospitals by main diagnosis, 2004/05



How to recognise the problem?

- History
  - Importance of the HPC
- Examination
- Investigation

Symptoms

- Dyspnoea
- Chest pain
- Haemoptysis

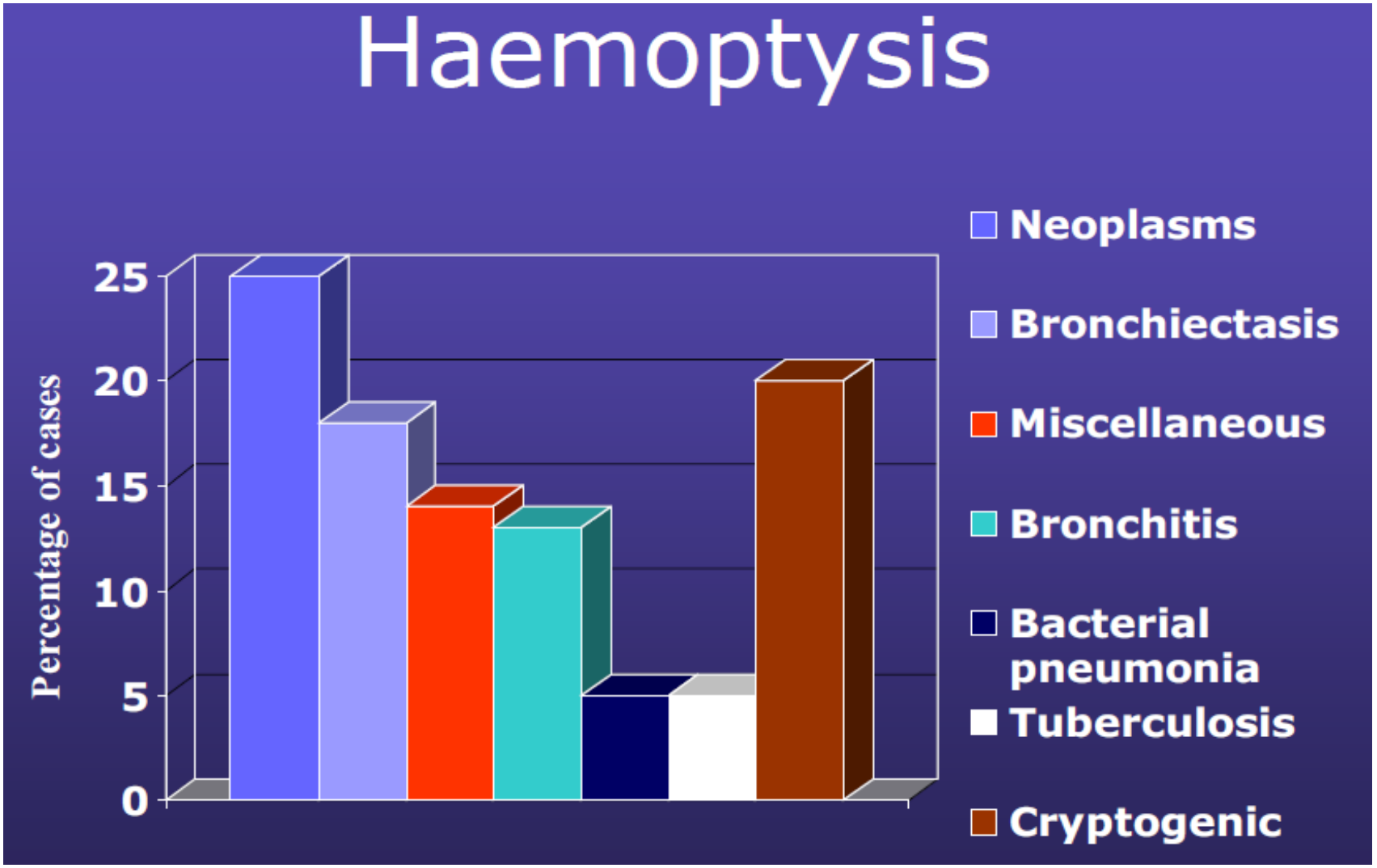
Dyspnoea: Pattern of Onset

- Sudden
  - Pneumothorax
  - PTE
  - Aspiration
  - Cardiac event – arrhythmia, MI
- Over hours / days
  - Asthma
  - Pneumonia
  - Pulmonary oedema
- Intermittent
  - Asthma
  - Hyperventilation
- Progressive
  - COPD
  - IPF
  - Pleural effusion
  - Anaemia
  - LVF
  - Pulmonary hypertension

Chest Pain

- Myocardial ischaemia
  - central
  - radiating to the jaw / arm(s)
  - squeezing / crushing / heavy weight
  - aggravated by exertion
  - relieved by rest / GTN
  - associated autonomic features

Haemoptysis



Examination

- Do not make the diagnosis from the history alone
- It is negligent not to examine a patient with new symptoms
- E.g. arrhythmia (esp AF / flutter)
  pneumothorax
  pericardial effusion

Observations

- HR
- BP
- Temp
- S_pO_2
- F_IO_2
- RR

Examination of the Chest

- *Expansion*
- *Percussion*
- *Auscultation*
  - *Air entry*
  - *Quality of breath sounds*
  - *Added sounds*
  - *Vocal resonance*

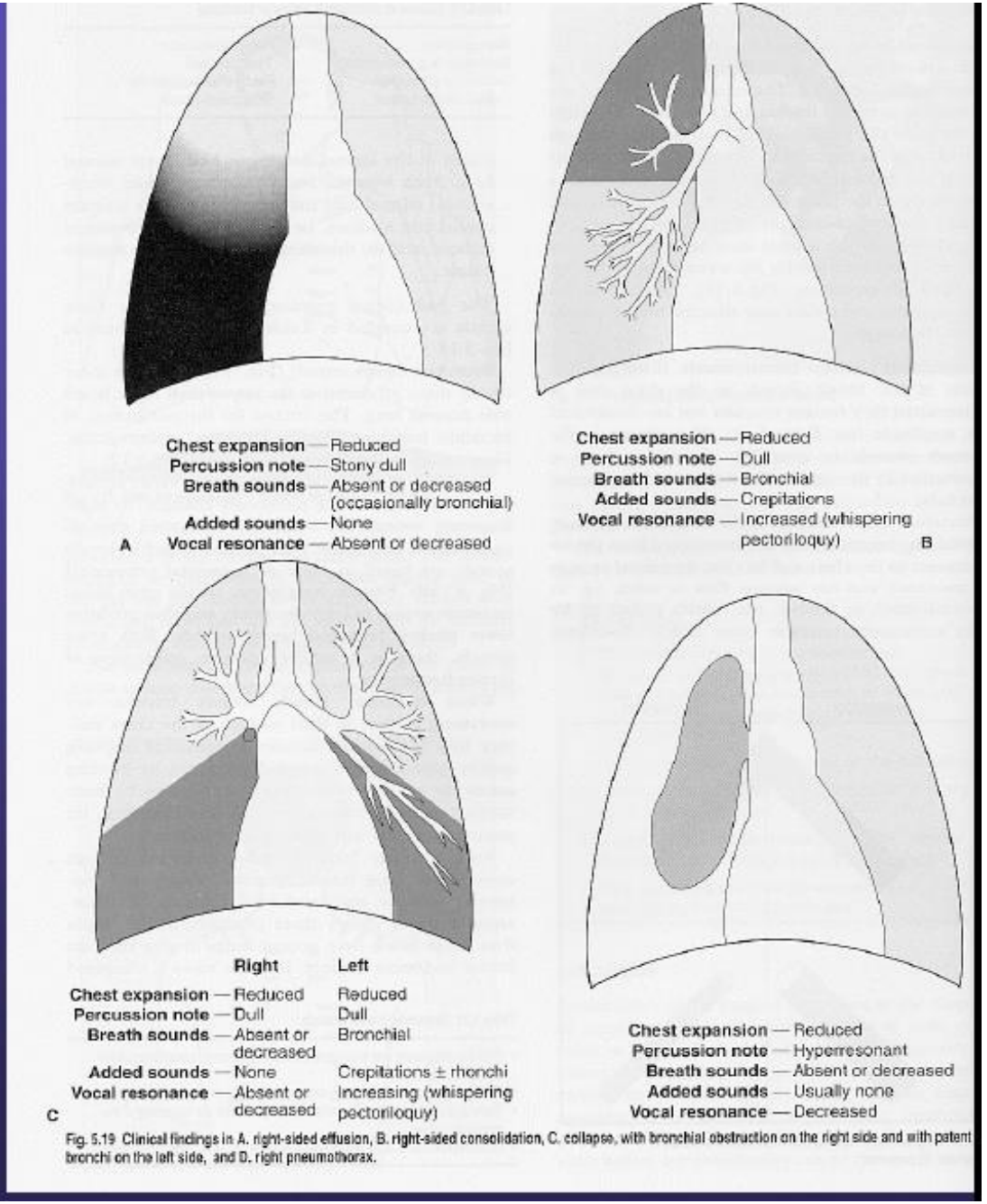


Fig. 5.19 Clinical findings in A. right-sided effusion, B. right-sided consolidation, C. collapse, with bronchial obstruction on the right side and with patent bronchi on the left side, and D. right pneumothorax.

Examination

- Wheeze
  - Asthma / COPD
  - Heart failure
  - Anaphylaxis
  - Foreign body
- Stridor
  - Foreign body
  - Epiglottitis
  - Anaphylaxis
- Crackles
  - Pulmonary oedema
  - Fibrosis
  - Pneumonia
  - Bronchiectasis
- Clear chest
  - PTE
  - Pneumothorax
  - Hyperventilation
  - Metabolic acidosis
  - Anaemia
  - Drug overdose

ECGs

- When can they be helpful?
  - Arrhythmia
  - Cardiac ischaemia
  - LVF
  - Pericardial effusion
  - P.E.
  - RVF / pulmonary hypertension

Diagnosis

- Exacerbation of COPD
- Decompensated type 2 respiratory failure

Treatment

- O — Oxygen
- N — Nebulised bronchodilators
- A — Antibiotics
- P — Prednisolone

Oxygen

- Nasal cannula
- Standard mask
- Mask with reservoir bag

- *Inspired oxygen concentratio… patient's minute ventilation – patient also breathes in an unknown amount of air*

Pneumothorax

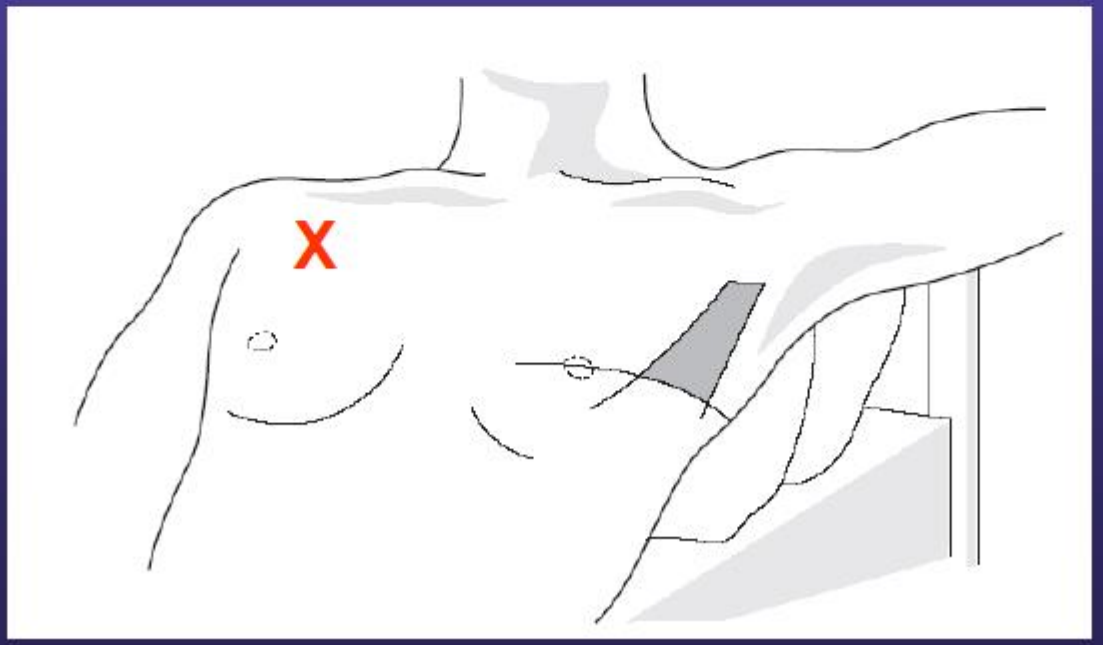
BTS Guidelines 2003

- **Defn:** Air in the pleural space
- **Primary** – no associated lung disease (subpleural bleb)
- **Secondary** – associated lung disease (typically fibrosis or emphysema)
- No of hospital admissions:
  - Men 16.7 / 100 000 / yr (approx 250 in Greater Glasgow)
  - Women 5.8 / 100 000 /yr
- Smoking is the greatest risk factor
  - 12% lifetime risk in smokers (cf 0.1% in non-smokers)
- Half recur within 4 years

Aspiration

+

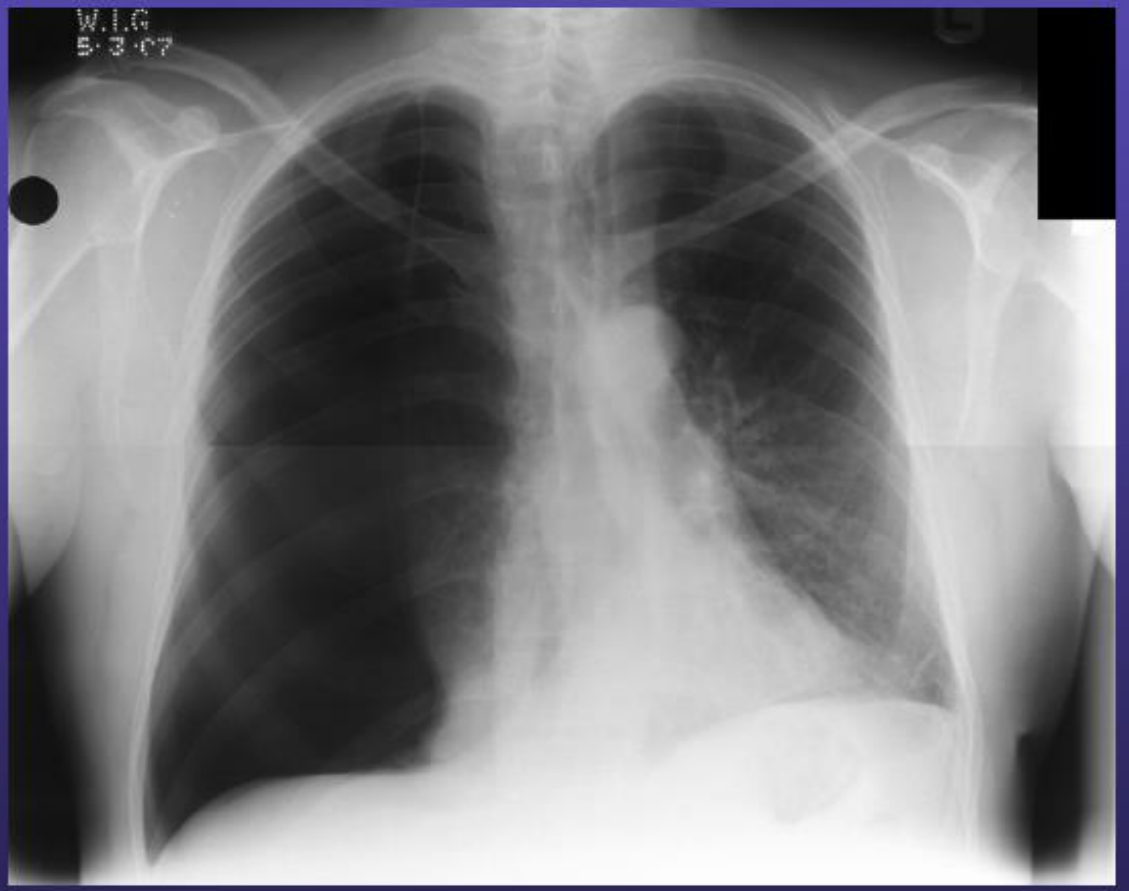
+



Chest Drain

Tension Pneumothorax

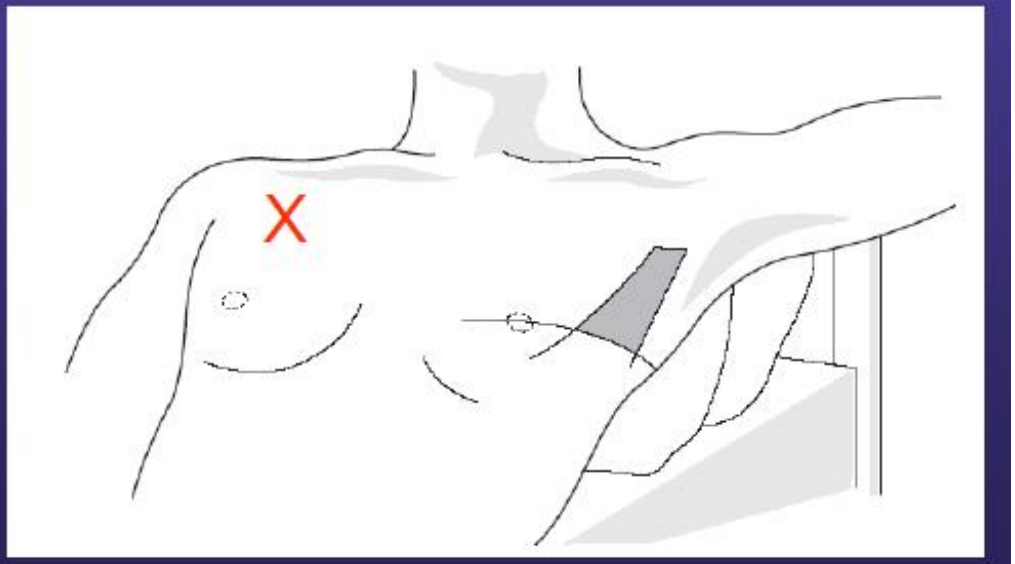
Not dependent on the size of the pneumothorax



Tension Pneumothorax

Treatment

- Cannula of at least 4.5cm length in 2nd ICS MCL



Pulmonary Embolism

- Typically PTE is present in 15 – 40% of cases where the diagnosis is considered
- Modern diagnostic pathway uses:-
  - clinical probability
  - D-dimer assay
  - CTPA

Table 1 Risk factors for venous thromboembolism

Major risk factors (relative risk 5–20):	
Surgery*	• Major abdominal/pelvic surgery
	• Hip/knee replacement
	• Postoperative intensive care
Obstetrics	• Late pregnancy
	• Caesarian section
	• Puerperium
Lower limb problems	• Fracture
	• Varicose veins
Malignancy	• Abdominal/pelvic
	• Advanced/metastatic
Reduced mobility	• Hospitalisation
	• Institutional care
Miscellaneous	• Previous proven VTE
Minor risk factors (relative risk 2–4):	
Cardiovascular	• Congenital heart disease
	• Congestive cardiac failure
	• Hypertension
	• Superficial venous thrombosis
	• Indwelling central vein catheter
Oestrogens	• Oral contraceptive
	• Hormone replacement therapy
Miscellaneous	• COPD
	• Neurological disability
	• Occult malignancy
	• Thrombotic disorders
	• Long distance sedentary travel
	• Obesity
	• Other†

*Where appropriate prophylaxis is used, relative risk is much lower.
†Inflammatory bowel disease, nephrotic syndrome, chronic dialysis, myeloproliferative disorders, paroxysmal nocturnal haemoglobinuria, Behçet's disease.

Imaging

- CTPA
  - rapidly becoming the first line test
  - sensitivity may be as low as 83% (PIOPED II NEJM 2006)
  - however, safe to withhold anticoagulation if CTPA negative (prevalence of further event by 3/12 ~ 1.5%) in low/moderate risk
  - debate as to best practice in CTPA –ve / high risk patients
  - very useful for revealing alternative diagnoses
- V/Q
  - a useful alternative where CT contraindicated (e.g. iodine allergy) – generally only useful if CXR normal and no chronic cardiorespiratory disease

Treatment

- LMW heparin
  - Difficulties arise with
    - obese patients
    - renal failure
    - rapid reversal
- Oral anticoagulation with warfarin
  - Aim for INR of 2 – 3
- Duration of anticoagulation
  - Temporary risk factors 4-6/52
  - Idiopathic 3-6/12
- Risk of major bleeding
  - ≤ 3% at 3/12
  - mortality ≤ 0.5%
- Investigation for cancer usually unnecessary

Severity of Acute Asthma

Features of acute severe asthma

- Peak expiratory flow (PEF) 33-50% of best *(use % predicted if recent best unknown)*
- Can't complete sentences in one breath
- Respirations ≥ 25 breaths/min
- Pulse ≥ 110 beats/min

Life threatening features

- PEF < 33% of best or predicted
- SpO_2 < 92%
- Silent chest, cyanosis, or feeble respiratory effort
- Bradycardia, dysrhythmia, or hypotension
- Exhaustion, confusion, or coma

IMMEDIATE TREATMENT

- Oxygen 40-60%
  (CO_2 retention is not usually aggravated by oxygen therapy in asthma)
- Salbutamol 5 mg or terbutaline 10 mg via an oxygen-driven nebuliser
- Ipratropium bromide 0.5 mg via an oxygen-driven nebuliser
- Prednisolone tablets 40-50 mg or IV hydrocortisone 100 mg or both if very ill
- No sedatives of any kind
- Chest radiograph only if pneumothorax or consolidation are suspected or patient requires IPPV

IF LIFE THREATENING FEATURES ARE PRESENT:

- Discuss with senior clinician and ICU team
- Add IV magnesium sulphate 1.2-2 g infusion over 20 minutes *(unless already given)*
- Give nebulised β_2 agonist more frequently e.g. salbutamol 5 mg up to every 15-30 minutes or 10 mg continuously hourly

SUBSEQUENT MANAGEMENT

IF PATIENT IS IMPROVING continue:

- 40-60% oxygen
- Prednisolone 40-50mg daily or IV hydrocortisone 100 mg 6 hourly
- Nebulised β_2 agonist and ipratropium 4-6 hourly

IF PATIENT NOT IMPROVING AFTER 15-30 MINUTES:

- Continue oxygen and steroids
- Give nebulised β_2 agonist more frequently e.g. salbutamol 5 mg up to every 15-30 minutes or 10 mg continuously hourly
- Continue ipratropium 0.5 mg 4-6 hourly until patient is improving

IF PATIENT IS STILL NOT IMPROVING:

- Discuss patient with senior clinician and ICU team
- IV magnesium sulphate 1.2-2 g over 20 minutes *(unless already given)*
- Senior clinician may consider use of IV β_2 agonist or IV aminophylline or progression to IPPV

What Is Asphyxia?

- Asphyxia happens when your body doesn't get enough oxygen to keep you from passing out. It can be a life-threatening situation.

- When you breathe normally, first you take in oxygen. Your lungs send that oxygen into your blood, which carries it to your tissues. Then your cells use it to make energy. Any interruption to the process of breathing in oxygen or breathing out carbon dioxide can make you pass out or even lose your life.

Physical Asphyxia

- One type of asphyxia is called "physical" or "mechanical." It happens when a force or object keeps you from breathing.

- Lots of accidents can lead to it. Some examples of physical asphyxia are:

- Choking. This is when food or an object gets stuck in your airway and blocks air from getting to your lungs. The elderly have a greater chance of this happening to them, especially those who live alone, wear dentures, or have trouble swallowing. Babies and toddlers also have higher odds of choking on large pieces of food or things they put in their mouths.

- Aspiration. It's different from choking. Aspiration happens when something you eat or drink "goes down the wrong pipe" and enters your airway or lungs. The substance crowds out the air in your body. Drowning is the most common type of aspiration.

- Suffocation (smothering). Suffocation happens when something heavy covers the face or chest and prevents you from breathing. It also occurs when you are in a place where oxygen runs out, such as a closed-in, airtight space.

- Strangulation. If a cord or rope or other object long enough to go around your neck presses on the airway, it blocks air from getting to your lungs.

- Drug overdose. Opioids affect your breathing. When you take too high a dose, it can slow down your breathing to the point that your body does not take in enough oxygen.

Seizure. It can cause asphyxia in several ways. Epileptic seizures may make your breathing suddenly pause (also called apnea), and lower oxygen in your body to life-threatening levels. Also, during a seizure, your body may move in such a way that your airway gets covered, blocking your breathing.

Chemical Asphyxia

Another type of asphyxia is called "chemical." In this type, a chemical keeps oxygen from reaching your cells.

Chemicals that can cause asphyxia include:

- Carbon monoxide. This is a colorless, odorless gas that comes from burning different types of fuel. If you breathe in too much of it, the gas builds up in your body and replaces the oxygen in your blood.
- Cyanide. It keeps cells from taking oxygen in. You're at risk of cyanide poisoning if you breathe smoke during a fire, have contact with certain industrial chemicals, or work in jobs like mining or metalworking.
- Hydrogen sulfide. This gas smells like a rotten egg. It can come from sewage, liquid manure, sulfur hot springs, and natural gas. If you breathe in too much, it can prevent oxygen from entering your cells, much like cyanide does.

The Heimlich maneuver

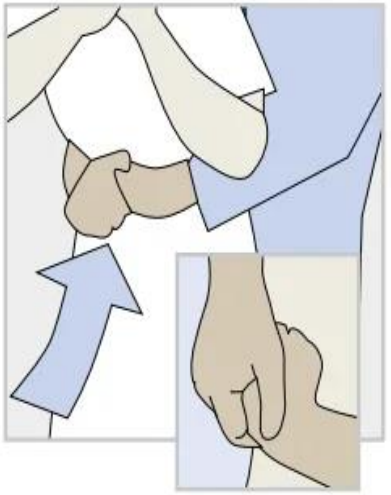
Do not perform the Heimlich maneuver if the victim is coughing, speaking or breathing. If the person cannot cough, speak or breathe, proceed as follows:

1. Stand behind the victim, wrap your arms around his or her waist.

2. Clasp your hands together in a double fist and place the fist — thumb side in — just below the victim's rib cage and above the navel*.

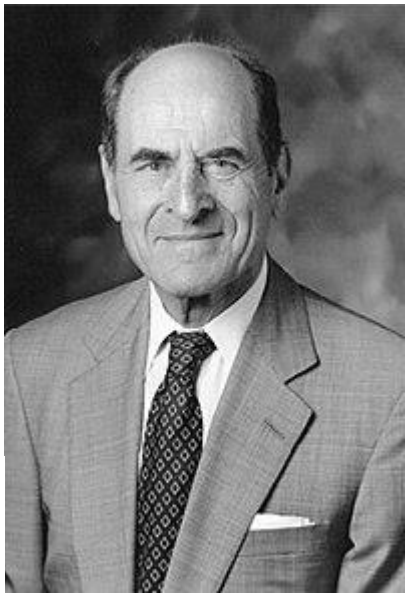
3. Press into the victim's abdomen (not the rib cage) with a quick, upward thrust.

4. Repeat thrusts until object is dislodged.



If you are alone

If alone and choking you can give yourself abdominal thrusts. Press your abdomen onto a firm object, such as the back of a chair.



Henry Heimlich