Acute breathlessness:

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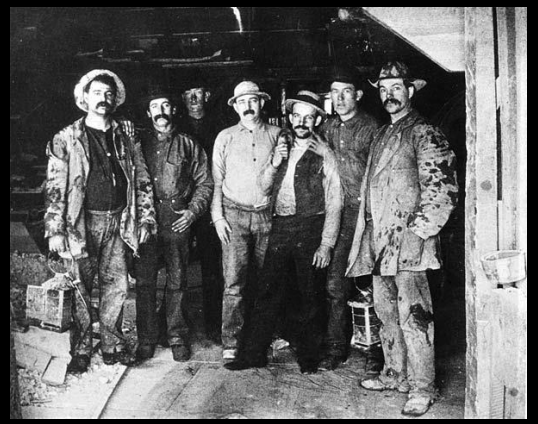
Declaration for Seema Brij

I have no financial interests or relationships to disclose with regard to the subject matter of this presentation.

Introduction

-what is breathlessness?
-what causes acute breathlessness?
-cases
-questions
-learning points


GREEKPLACE



Breathlessness

dyspnoea - clinical term for breathlessness or shortness of breath (SOB)
"dys" meaning painful, difficult, or disordered and "pnoea" meaning breathing

defined as the sensation of difficult or uncomfortable breathing

subjective experience that is not always consistent with physical findings

pathophysiology of dyspnoea involves complex interactions between peripheral and central sensory receptors and cognition

physiological, psychological, behavioural, social and environmental factors play a part in the pathogenesis and modulation of dyspnoea

Physiological mechanism	Example
Heightened Ventilatory Demand	Emphysema (pink puffers) Hypoxaemia at altitude Deconditioning Impaired cardiac function Anaemia
Respiratory Muscle Abnormalities	Neuromuscular disease Respiratory muscle weakness
Abnormal Ventilatory Impedence	Asthma/COPD (increased airway resistance) Interstitial Lung Disease (decreased compliance)
Abnormal Breathing Patterns	Cheyne-Stokes Hyperventilation
Blood-gas Abnormalities	Hypoxia Hypercapnia Metabolic acidosis (Kussmaul’s Breathing)

Sudden-onset	Days	Days to Weeks	Weeks to Months	Months to Years
-Pneumothorax -PE -MI -LVF -Asthma -Anaphylaxis -Hyperventilation	-Asthma -Pneumonia -IECOPD -Pleural effusion	-IECOPD -Pleural effusion -Pneumonitis -CCF -Anaemia	-Pleural effusion -Anaemia -Uraemia -Cirrhosis -Pregnancy	-Emphysema -Lung Fibrosis -Pulmonary Hypertension -Cor Pulmonale -Neuromuscular disorders -Chest wall deformity -Obesity -OSA -Hyperventilation

When referring to illness...

acute

means sudden and severe, while...

chronic

means worsening over time.

REMEMBER

To remember CHRONIC, it helps to know that the prefix CHRON means **time** (as in CHRONological and anaCHRONistic).

Case 1

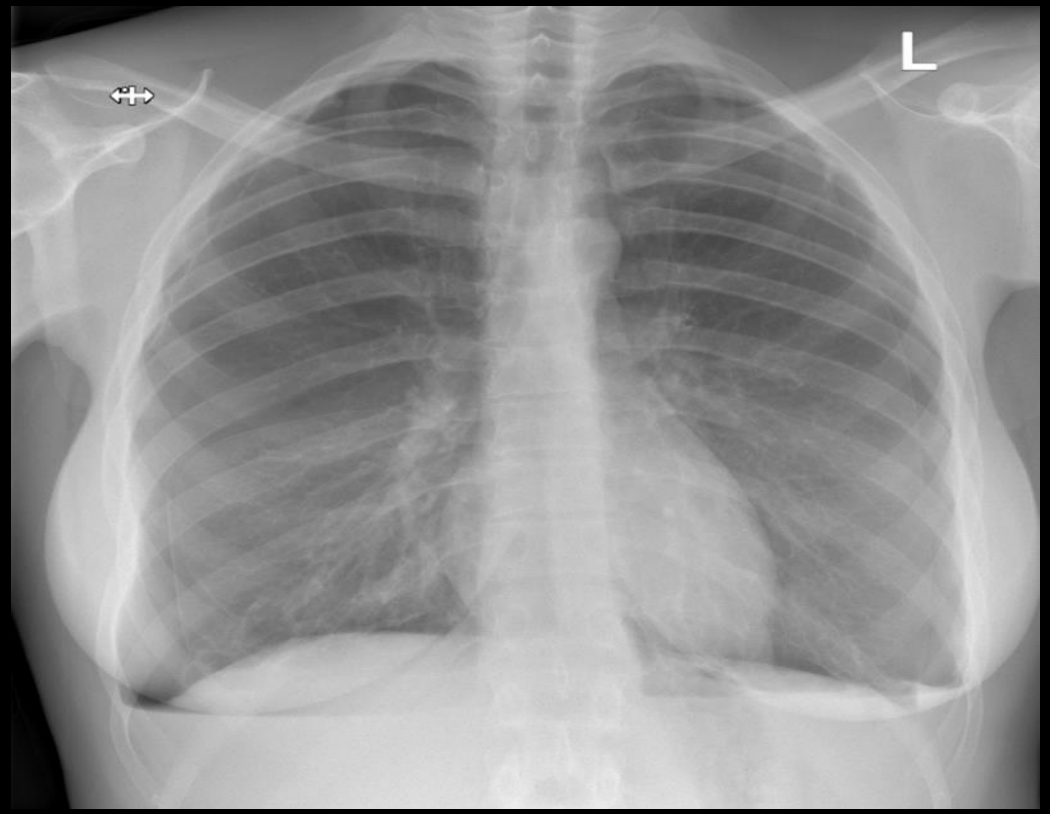
22 year old female presents with sudden onset inability to take a deep breath preceded by chest pain that has now resolved

Smokes cannabis, at university studying event management, lives with boyfriend

No past medical history and no regular medication

Able to give a full history and appears comfortable at rest

Obs stable (SaO2 98% room air, BP 110/65 mmHg, PR 85 bpm, RR 18 bpm, temp 37 °C)

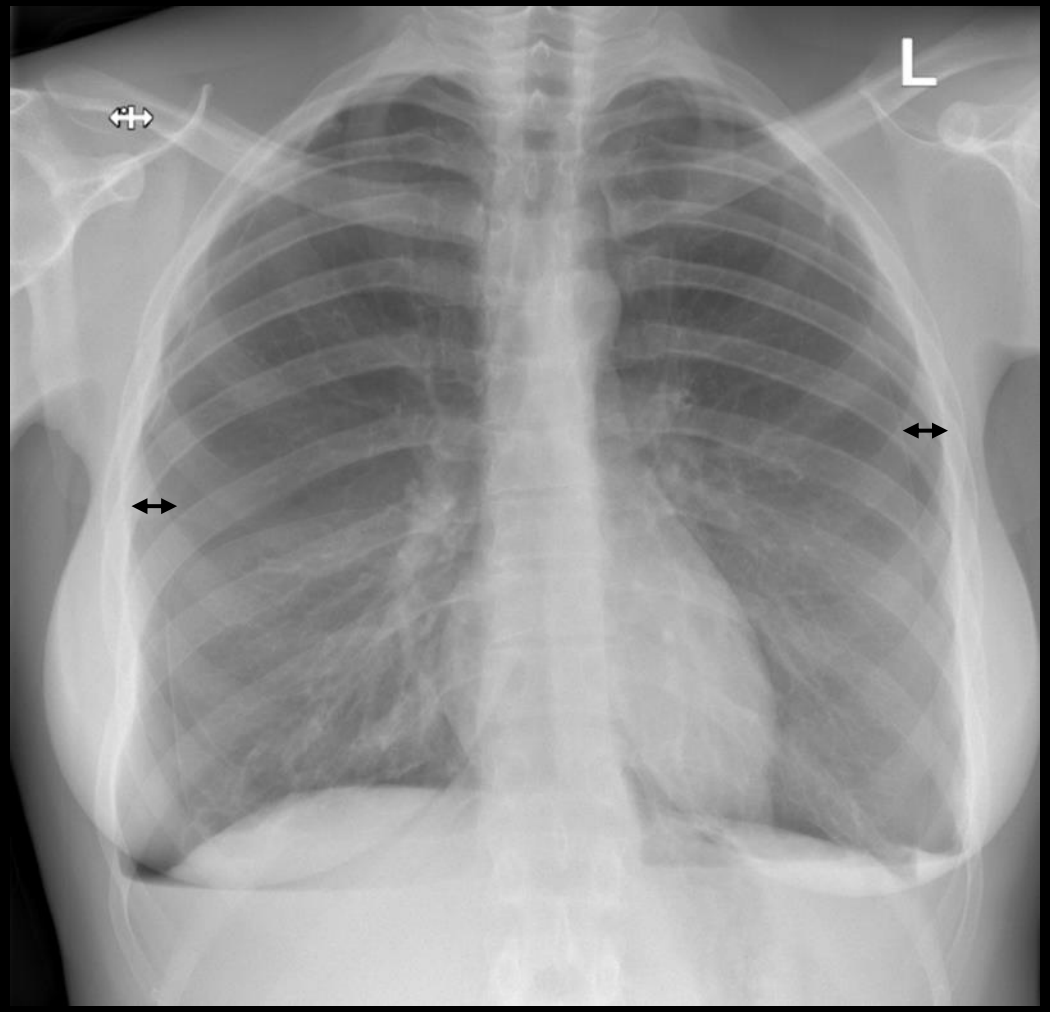


Iatrogenic

subclavian central line placement
PPM placement
pulmonary needle biopsy (transthoracic and transbronchial)
nasogastric tube placement
positive pressure ventilation
acupuncture on the chest wall

Spontaneous (tall, thin young people)

Secondary
Common lung disease (asthma, COPD, CF, ILD)
Rare lung disease (Histiocytosis/PLCH, LAM)
Infection (pneumonia, TB)
Connective tissue disease (Marfan's, SLE, Rheumatoid, ANCA-associated vasculitis)
Trauma



How big are these pneumothoraces?

Case 1 contd

What are you going to do?

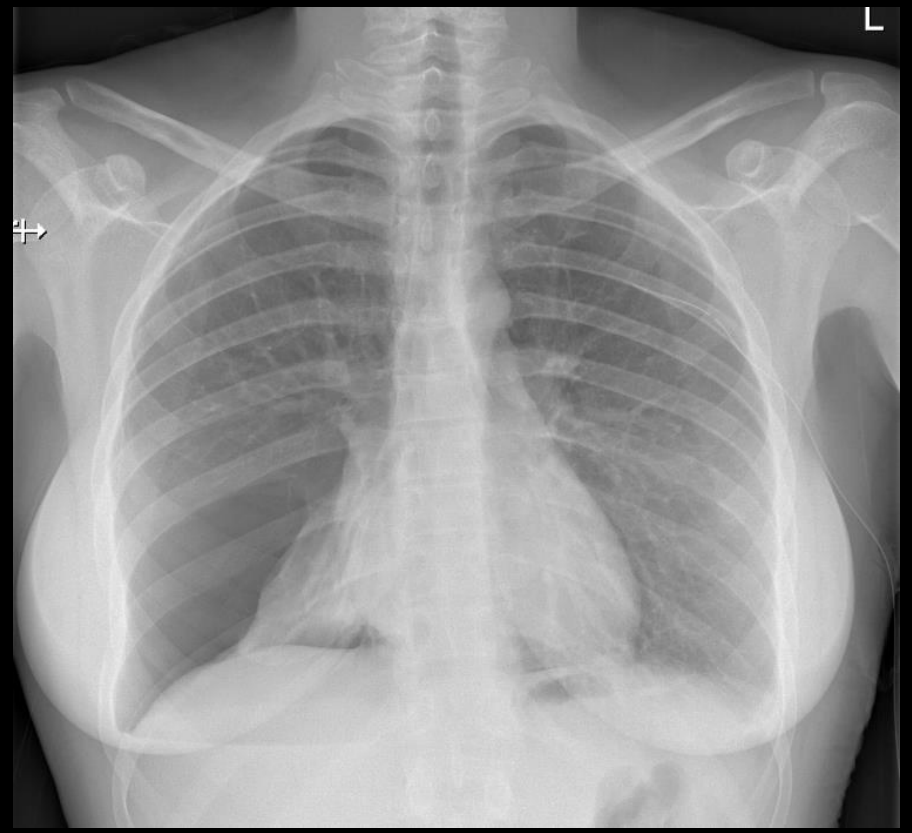
Admit and…

observe
aspirate left
aspirate right
chest drain left
chest drain right
bilateral chest drains

Case 1 contd

Observed and referred to Thoracic Surgical Team for primary bilateral repair

Went out for a cigarette and became more breathless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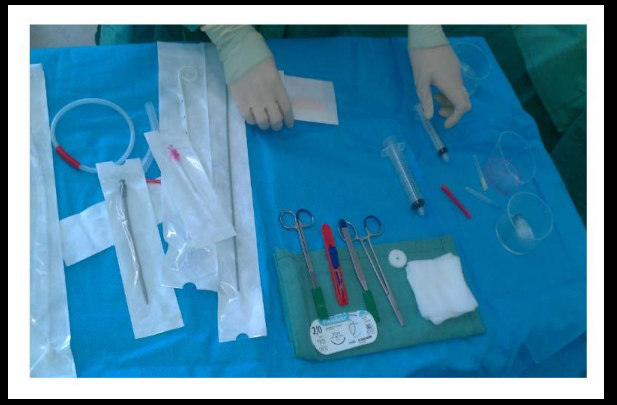
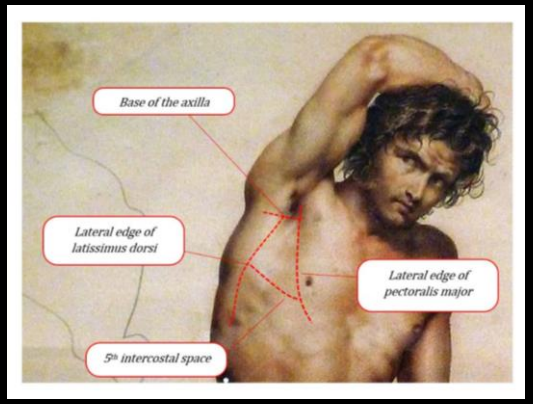
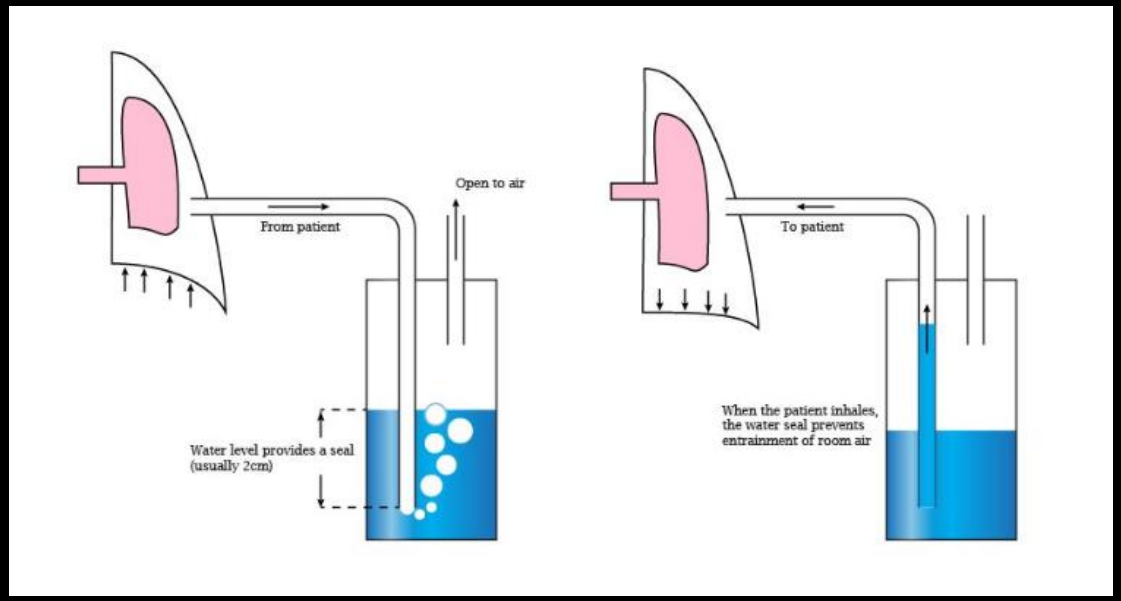



Base of the axilla
Lateral edge of latissimus dorsi
Lateral edge of pectoralis major
5th intercostal space

Case 1 contd.

Chest drain management



Case 1 contd.

More breathless in the night – obs stable

-is this a drain problem?
-tension pneumothorax?
-worsening surgical emphysema?
-has the right lung deflated?

Assess patient's chest

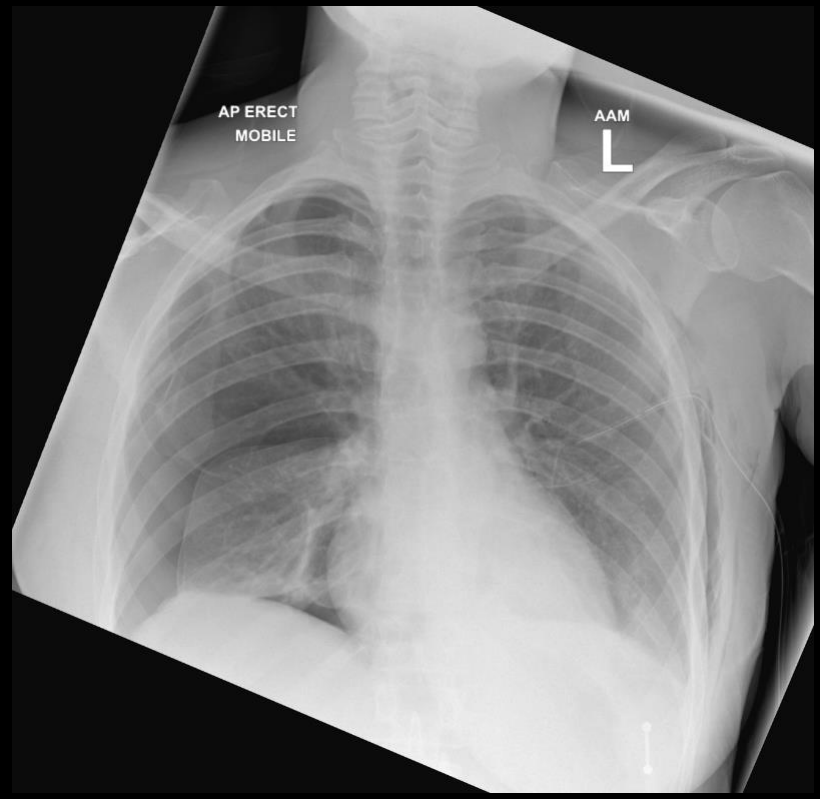
-is chest size symmetrical?
-are both sides moving?
-is there tracheal shift?
-is there surgical emphysema?
-is there hyper-resonant PN?
-are there BS and equal bilaterally?

Assess chest drain bottle

-is it holding a column of water?
-is it swinging?
-is it still bubbling?

Assess chest drain site

-is the drain still in the chest?
-is the drain kinked?
-is there surgical emphysema?


AP ERECT
MOBILE
AAM
L

Case 1 contd.

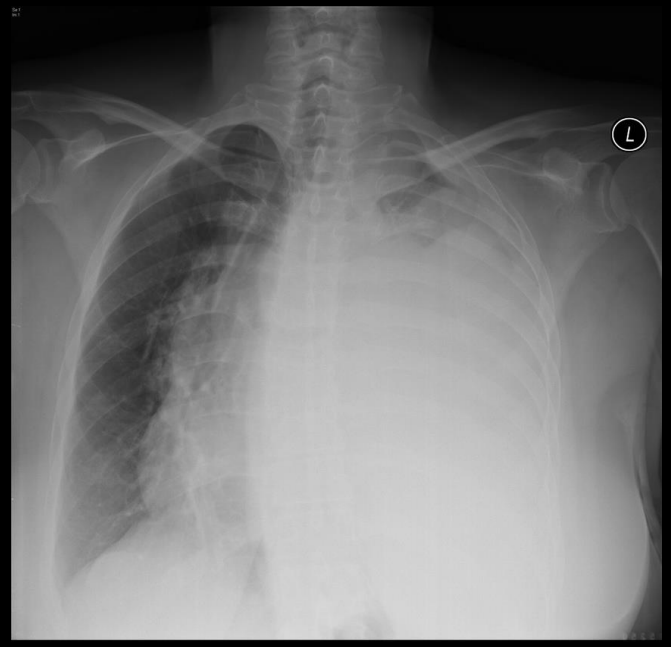
Life-saving maneouvres:
-flush drain with 10 ml normal saline

-large bore cannula in second interval space mid-clavicular line

Pleural disease is hard

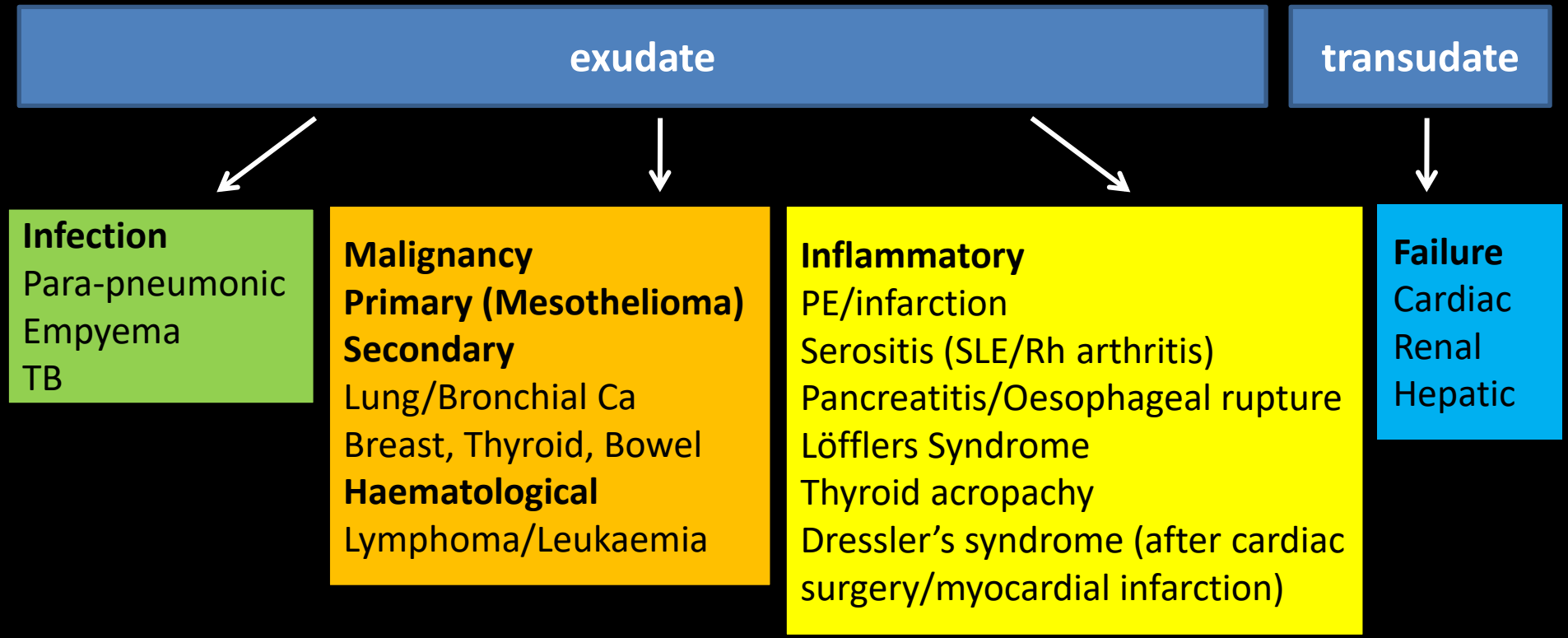
-effusions but what is the cause?

bilateral pleural effusions in pt with CKD and fluid overload despite dialysis



large left pleural effusion in pt with known metastatic breast cancer – note mediastinal shift

small left pleural effusions in pt who is later found to have pleural TB


exudate
transudate
Infection
Para-pneumonic
Empyema
TB
Malignancy
Primary (Mesothelioma)
Secondary
Lung/Bronchial Ca
Breast, Thyroid, Bowel
Haematological
Lymphoma/Leukaemia
Inflammatory
PE/infarction
Serositis (SLE/Rh arthritis)
Pancreatitis/Oesophageal rupture
Löfflers Syndrome
Thyroid acropachy
Dressler's syndrome (after cardiac surgery/myocardial infarction)
Failure
Cardiac
Renal
Hepatic

Case 2

-on-call @ 02:30

-asked to see a 68 year old man on the surgical wards who has become more breathless

-day 3 post-operative (perforated sigmoid diverticulum requiring emergency laparotomy and sigmoid colectomy; ileostomy formed)

-feels awful - sore, tired and breathless

-orientated and conversant: SaO_2 94% FiO_2 0.35 Venturi (35%V); BP 102/64 mmHg; pulse 103 bpm; RR 19 bpm; temp 37.5 ºC

-ABG on 35%V: pH 7.35; pCO_2 4.6 kPa; pO_2 11.3 kPa; HCO_3^- 20.4 mmHg; BE -3.2 mmol/L

Case 2 contd.

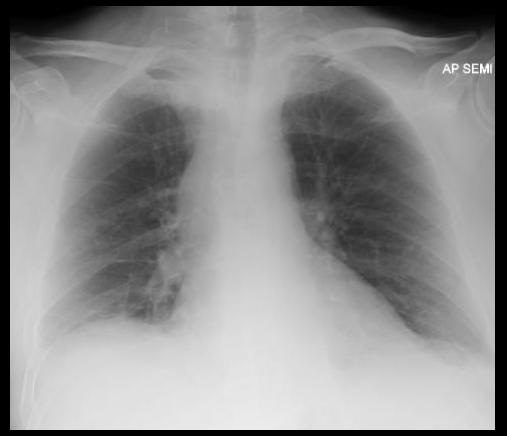
Acute pulmonary oedema
Acute asthma
PE

Hospital acquired pneumonia

commonly encountered scenarios:
-medically fit awaiting discharge and then becomes pyrexial
-post-surgical (pain medication; rigid abdomen; positioning)
-admitted with another problem and whilst recovering, complicated by sepsis ? cause

pre-op

11/04/2022

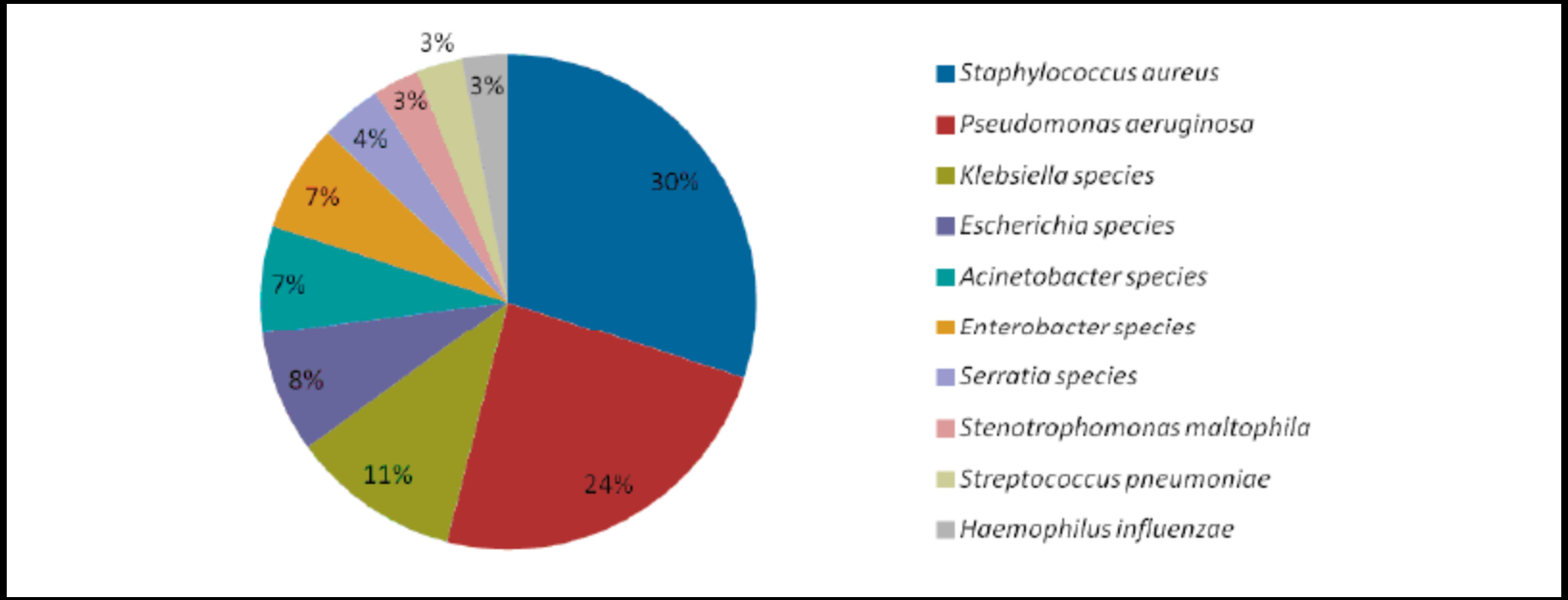


15/04/2022

Hospital acquired pneumonia

consider:
-immune status (relative or absolute immuno-compromise)
-co-morbidities and ability to protect airway
-impairment of swallow
-escalation status

The most commonly identified pathogens among adults with HAP (SENTRY study USA)



Case 3

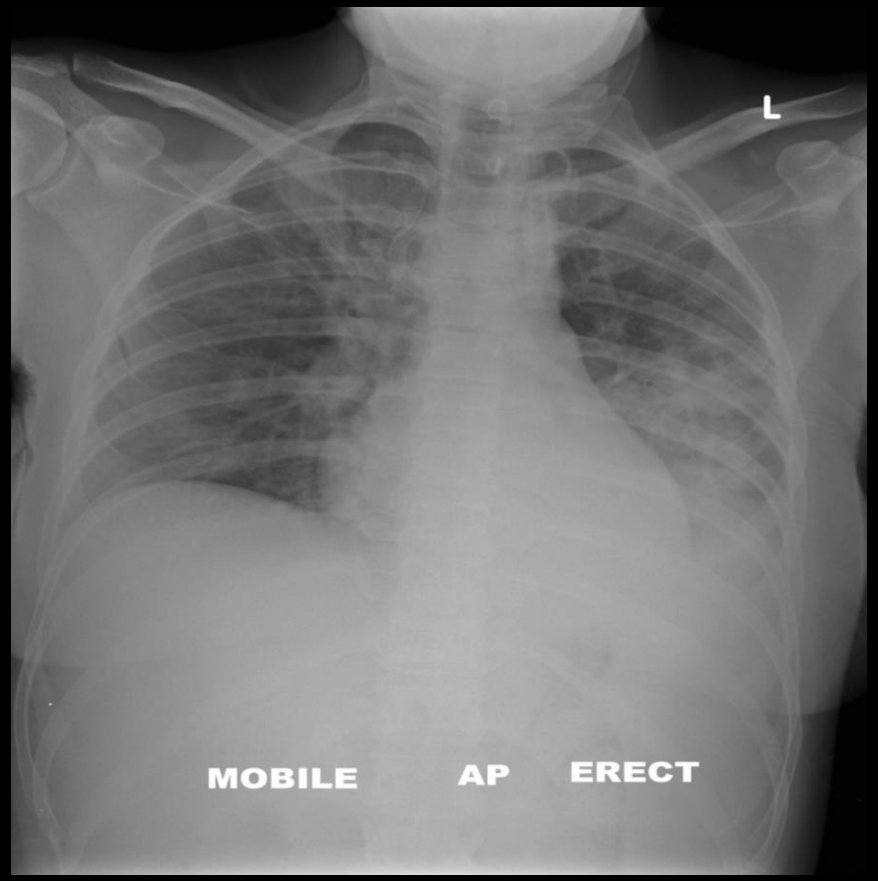
-26 year old lady, previously fit and well, housewife, 2 children under the age of 4, no pets/birds, smoker 10 cigarettes per day

-2 day history shortness of breath, cough with brown and green sputum, fevers and feeling increasingly unwell

-alert and orientated; SaO2 92% room air; BP 102/61 mm Hg; PR 105/min; RR 22/min; temp 38.2 C

-Hb 11.1 g/L; neuts 18.1 $x10^9$/L; urea 4.4 mmol/L; CRP 214 mg/L; Na 130 mmol/L; glucose 6.2 mmol/L

-ABG on 28%V: pH 7.41; pCO2 3.5 kPa; pO2 10.1 kPa; HCO3- 23.8 mmHg; BE 1.8 mmol/L

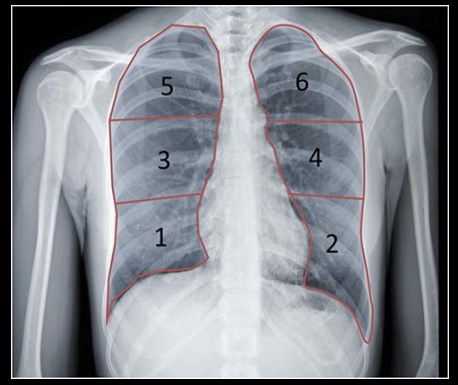


How severe is her pneumonia?

-hypoxic on air
-low pO2 on 28% FiO2
-A-a gradient 12 kPa (expected 1.5 kPa)

A-a gradient = [(FiO2) × (Atmospheric Pressure - H2O Pressure) - (PaCO2/0.8)] – PaO2 from ABG

What is her risk of mortality from pneumonia?



Any of:
- **C**onfusion*
- **U**rea >7 mmol/l
- **R**espiratory rate ≥30/min
- **B**lood pressure (SBP <90 mm Hg or DBP ≤60 mm Hg)
- **A**ge ≥65 years

score	30 day mortality
0	0.6
1	2.7
2	6.8
3	14.0
4 or 5	27.8

Gestalt and severity of CAP

Younger adults with pneumonia have lower mortality because CAP is a curable condition

Younger adults with less co-morbidity are eligible for circulatory and ventilatory support on ITU

CURB65 score on admission stratifies **mortality** but plain chest radiograph may be a better indicator of who is more likely to deteriorate despite timely and active treatment - extent of consolidation and presence of pleural effusion

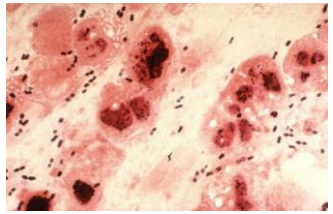
BTS 2009 guidance states “…the CURB65 score in conjunction with **clinical judgement** is recommended as the initial severity assessment strategy in hospitals for CAP.”

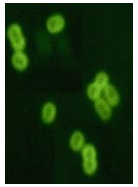
Case 3 contd.

What is the likely pathogen causing her pneumonia?

microbial diagnosis of pneumonia is achieved in <50% cases and anti-microbial therapy therefore should be empirically administered

Streptococcus pneumoniae (Pneumococcus) is the commonest pathogen identified





Gram (+)ve diplococci

What is a CAP screen?

blood culture
sputum for M,C&S, TB culture
pneumococcal and Legionella urinary antigen
(paired) serology (Mycoplasma, Coxiella)
HIV test
viral swab

Case 3 contd.

-just finishing off writing notes when nurse asks you to come and see the lady with CAP because "…she's gone very red and has difficulty breathing…"

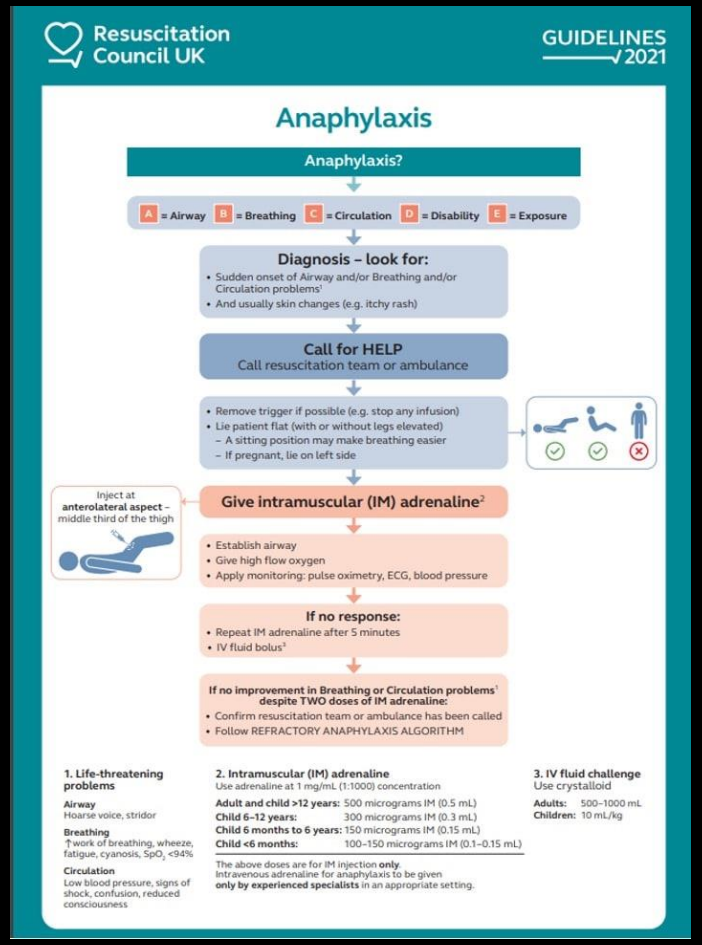


Table 3. Medication Risk for Hospital-Acquired Anaphylaxis

Risk	Drug	Episodes per Persons Exposed
High	Streptokinase	284 per 10^5
	Platelet concentrates	378 per 10^5
	Snake antivenom	95 per 10^5
Intermediate	Parenteral penicillin	32 per 10^5
	Iodinated radiologic contrast	71 per 10^5
	Blood products	55 per 10^5
	Dextran	36 per 10^5
Relatively low	NSAIDs	16 per 10^5
	Antibiotics	6 per 10^5

NSAID: nonsteroidal anti-inflammatory drug.
Source: Reference 16.

Penicillin

-was discovered by Alexander Fleming in 1928 and is a beta-lactam antibiotic

-approx 10% patients report an allergy of which 90% is not true allergy

-incidence penicillin anaphylaxis is 0.02-0.04% and is mediated by type 1 hypersensitivity

-cutaneous eruptions most commonly reported reaction

-cross-reactivity with cephalosporins may have been over-estimated

-cross-reactivity with aminopenicillins is less than 2%, carbapenems less than 1% and cephalosporins less than 3%

Case 4

-28 year old woman G3 P2; 35+4; previously 2x NVD

-born in Egypt; UK 2023; Arabic speaker; non-smoker

-seen in ED and generally unwell with breathlessness for 2 days and dry cough

-appears comfortable at rest; speaking in complete sentences

-alert and orientated; SaO2 97% room air; BP 106/76; PR 95/min; RR 18/min; temp 36.9 ºC

-“Please exclude PE”

VTE in pregnancy

relative risk of VTE in pregnancy is increased 4-6 fold

-occurs in about 1/1,000 pregnancies in women under the age of 35

-occurs in 2.4/1,000 pregnancies in women over the age of 35

-inherited thrombophilia is present in 30-50% of women with pregnancy-associated VTE

-post-partum, risk of VTE doubles

CXR is probably normal
-ED Consultant queried bilateral hilar lymphadenopathy

Eosinophilia 0.7 x10(9)/L

Asthma History

-no previous history asthma or inhaler usage
-no pets/birds at home
-since moving to UK has “hayfever”
-children do not suffer with asthma

Risk VTE

-no blood clots in previous pregnancies
-no family history VTE
-no recent immobility
-no swelling of legs

Case 4 contd.

Leading questions:

-if you do nothing, are you breathless?

-does your breathlessness come on immediately you start moving?

-how quickly does your breathlessness settle if you sit down?

Walk with her using oximeter and see for yourself…

Have you identified an alternative cause for breathlessness?

Acute bronchitis – likely new presentation of asthma

Discharged home to complete 5/7 course Prednisolone, Fostair 100/6 started plan to be reviewed in Asthma in Pregnancy Clinic

ED Consultant not happy
-requested V/Q scan declined as if has asthma, there may be altered perfusion

-CTPA undertaken – no PE identified

Investigating VTE in pregnancy (RCOG)

ECG and a chest X-ray (CXR) should be performed

In women with suspected PE who also have symptoms and signs of DVT, compression duplex ultrasound should be performed. If compression ultrasonography confirms the presence of DVT, no further investigation is necessary

In women with suspected PE without symptoms and signs of DVT, a ventilation/perfusion (V/Q) lung scan or a computerised tomography pulmonary angiogram (CTPA) should be performed

When the chest X-ray is abnormal and there is a clinical suspicion of PE, CTPA should be performed in preference to a V/Q scan

To exclude PE, a perfusion scan may be sufficient

Case 4 contd.

-seen in Asthma in Pregnancy Clinic

-atopic (raised IgE; strongly positive HDM; negative ANCA; negative Strongyloides serology)

-FeNO 12 ppb whilst compliant with inhalers

-reassured both oral and inhaled corticosteroid are safe in pregnancy

-normal vaginal delivery 40+1 without complications to date, healthy baby boy 3210 g

Learning points

Pleural disease

-difficult

-what is the cause of the effusion?

-assess patient, chest drain site and chest drain bottle

Pneumonia

-severity of CAP may not be reflected by CURB-65 score

Pregnancy

-VTE is rare

-alternative diagnosis and treat


BBC
RADIO
4
Any
Questions?