

Respiratory Revision

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Topics Covered

Curriculum		
System	Index Condition	Priority
RS1	Asthma	1*
RS2	Chronic Obstructive Pulmonary Disease (COPD)	1*
RS3	Respiratory Failure	1*
RS4	Pneumonia	1
RS5	Pulmonary Embolism	1*
RS6	Deep Vein Thrombosis	1
RS7	Oxygen Therapy	1*
RS8	Carcinoma of the Bronchus	2
RS9	Pulmonary Tuberculosis	2
RS10	Pleural Effusion and Pleural Disease	2
RS11	Pneumothorax	2*
RS12	Chest Trauma / Haemothorax	3*
RS13	Bronchiectasis and Cystic Fibrosis	3
RS14	Sarcoidosis	3
RS15	Interstitial Lung Disease	3
RS16	Obstructive Sleep Apnoea	3
RS17	Pulmonary Hypertension	3
RS18	Occupational Lung Disease	3

Priorities

1. Asthma
2. COPD
 - Respiratory Failure/Oxygen
3. PE/DVT
4. Pneumonia
 - Pleural Effusion



A few Notes

- Not Questions
- Differential Diagnosis Questions

- Get off the Fence!
- Get Involved!



Ms JT

- You are asked to see Ms JT a 19 year old in A&E she is a known asthmatic who describes a 1 week history of cough and wheeze.
- She saw her GP 3 days ago who prescribed a course of amoxicillin, but she has presented to A&E now as she is feeling worse. She has attended A&E 3 times this year, but self discharged on each occasion “to look after her children”
- PMH – Nil
- DH – Seretide, Salbutamol, Monteleukast
- SH – Lives with her 3 children all <5, smokes 5/day, no ETOH, full time mother



On Examination

- T 36.3, BP 100/70, P 90 Reg, Sats 98% on Air, RR 20
- Expiratory wheeze throughout both lung fields
- CVS/Abdo – Unremarkable



What is the next investigation you would request/perform?

- Ms JT a 19 year old in A&E she is a known asthmatic who describes a 1week history of cough and wheeze. She saw her GP 3 days ago who prescribed a course of amoxicillin, but she has presented to A&E now as she is feeling worse. She has attended A&E 3 times this year, but self discharged on each occasion “to look after her children”
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2. Chest Radiograph
3. Peak Expiratory Flow Rate
4. Skin Prick Testing
5. Sputum Culture



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1. Arterial Blood Gas
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5. Sputum Culture

Initial Investigations

1. Arterial Blood Gas – Indicated only if hypoxic ($\text{SpO}_2 < 92\%$)
2. Chest Radiograph – Indications in Asthma:
 - Suspected pneumothorax
 - Suspected consolidation
 - Life threatening/near fatal asthma
 - Failure to respond to treatment
3. Peak Expiratory Flow Rate – Helps:
 - Confirm Diagnosis
 - Define severity →
 - Guide Intensity of Management
 - Assess need for Admission
 - Objectively measure response to treatment
4. Skin Prick Testing:
 - May support diagnosis of asthma in outpatient setting
 - Not appropriate in emergency setting
5. Sputum Culture
 - No role unless associated pneumonia



Ms JT's Peak Flow is 400 l/min comparing to a best of 450 and predicted of 500, how would you grade the severity of this exacerbation?

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1. Mild
2. Moderate
3. Severe
4. Life-Threatening
5. Near Fatal



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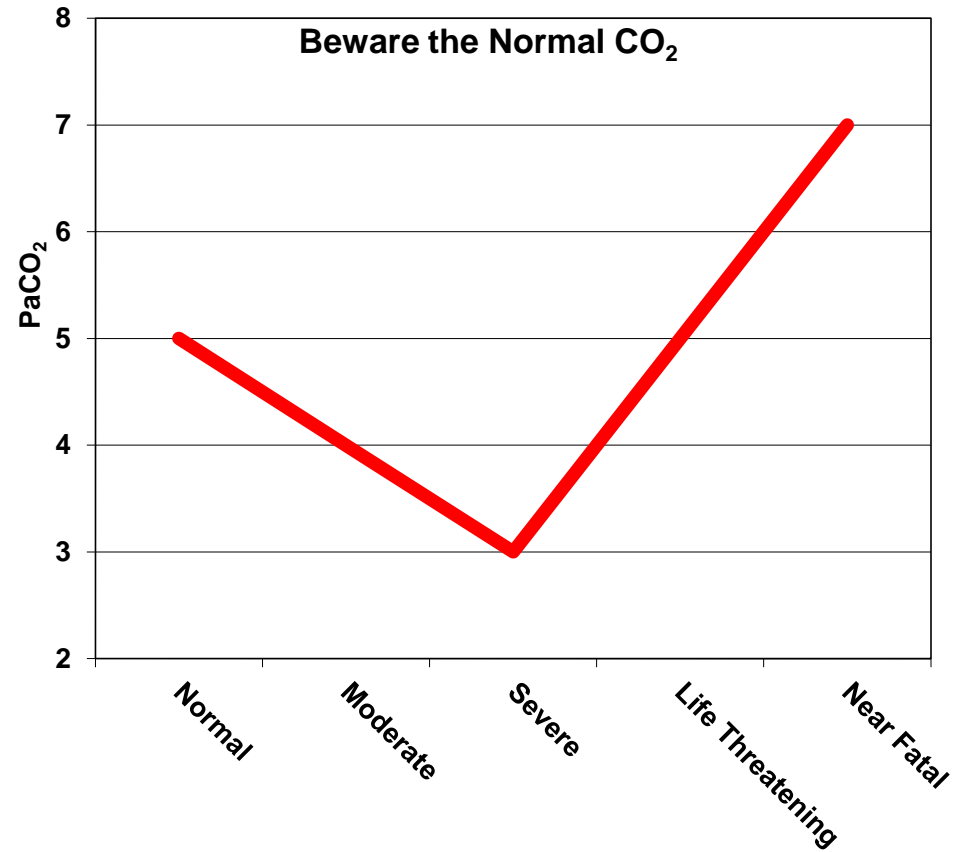


Severity Grading

Feature	Moderate	Severe	Life Threatening	Near Fatal
General	Worsening Symptoms	Unable to complete sentences	Exhaustion	Mechanical Ventilation
Examination:				
Respiratory		Rate ≥ 25	Feeble Effort Cyanosis Silent Chest	
Cardiac		Heart Rate ≥ 110	Bradycardia Arrhythmia Hypotension	
Neurological			Confusion Coma	
Peak Flow	50-75%	33-50%	< 33%	
Ventilation:				
SpO ₂			< 92%	
PaO ₂			< 8 kPa	
PaCO ₂			Normal	\uparrow PaCO ₂

Severity Grading

- Any one feature puts the patient in the more severe category
- How do you define % Peak Flow?
 - Compared to Predicted or Best?
 - Best is “most useful clinically”



As she meets the criteria for a mild exacerbation you plan to send Ms JT home, when you discuss her with your registrar he suggests that you admit her for observation as he is concerned that she may deteriorate. Which of the following in Ms JT's history is not a risk factor for increased mortality in asthma?

1. Antibiotic prescription by her GP
2. History of Self Discharge
3. Repeated A&E attendances
4. Use of Monteleukast
5. Young Children at home



As she meets the criteria for a mild exacerbation you plan to send Ms JT home, when you discuss her with your registrar he suggests that you admit her for observation as he is concerned that she may deteriorate. Which of the following in Ms JT's history is **NOT** a risk factor for increased mortality in asthma?

1. Antibiotic prescription by her GP
 - Not directly but \approx Inadequate Treatment
2. History of Self Discharge
3. Repeated A&E attendances
4. Use of Monteleukast
 - Not directly but is on 3 classes of medication
5. Young Children at home
 - Not directly, but may \approx
 - Unemployment
 - Social Isolation
 - Severe Stress



Risk Factors for Asthma Death

- Disease Factors:
 - Previous Near Fatal Asthma
 - Previous Admission
 - ≥ 3 Classes of Asthma Medication
 - Heavy use of β_2 -Agonist
 - Repeated A&E Attendances
 - “Brittle” Asthma
- Medical Factors:
 - Inadequate:
 - Treatment
 - Monitoring
 - Follow Up
 - Referral
 - Under use of written management plans
 - Inappropriate prescribing:
 - β -Blockers
 - Heavy Sedation
 - Aspirin/NSAID's
- Behavioural/Psychosocial Factors
 - Non-Compliance
 - DNA's
 - Self Discharge
 - Psychiatric Illness/DSH
 - Major Tranquilliser use
 - Denial
 - ETOH/Drugs
 - Obesity
 - Learning Difficulties
 - Employment/Income Problems
 - Social Isolation
 - Childhood Abuse
 - Severe Stress



You are called back to see Ms JT on the Observation Ward as she is more wheezy, unable to complete full sentences and her peak flow has dropped to 140 (Best = 450). Which of the following would be the least appropriate management option?

1. Aminophylline Infusion
2. Ipratropium Nebulisers
3. Intravenous Magnesium
4. Oral Steroids
5. Salbutamol Nebulisers



You are called back to see Ms JT on the Observation Ward as she is more wheezy, unable to complete full sentences and her peak flow has dropped to 140 (Best = 450). Which of the following would be the LEAST appropriate management option?

1. Aminophylline Infusion
2. Ipratropium Nebulisers
3. Intravenous Magnesium
4. Oral Steroids
5. Salbutamol Nebulisers

• PEF of 140 = 31% of Best = Life Threatening Asthma

Acute Asthma Management

1. Aminophylline Infusion
 - Minimal increased bronchodilation
 - High risk of arrhythmias
 - Not routinely recommended
2. Ipratropium Nebulisers
 - Additional bronchodilation
 - Recommended in Life Threatening/Near Fatal Asthma
3. Intravenous Magnesium
 - Additional bronchodilation
 - Recommended in Life Threatening/Near Fatal Asthma
4. Oral Steroids
 - Treat inflammation (underlying cause)
 - iv no better than Oral
5. Salbutamol Nebulisers
 - First line bronchodilator
 - Inhaler via spacer usually as good as nebulised

After 3 days as an inpatient you consider sending Ms JT home, which of the following would suggest that she is not ready to be discharged?

1. On Oral Amoxicillin
2. Using regular Nebulised Salbutamol
3. Morning Peak Flow 350 (Best 450, Evening 400)
4. Evening Peak Flow 400 (Best 450)
5. Still wheezy on auscultation

After 3 days as an inpatient you consider sending Ms JT home, which of the following would suggest that she is **NOT** ready to be discharged?

1. On Oral Amoxicillin
2. Using regular Nebulised Salbutamol
3. Morning Peak Flow 350 (Best 450, Evening 400)
4. Evening Peak Flow 400 (Best 450)
5. Still wheezy on auscultation

Discharge Criteria

1. On Oral Amoxicillin
 - Can be discharged as long as meets usual resolving infection criteria e.g. afebrile >48 hours, ↓ CRP
2. Using regular Nebulised Salbutamol
 - Need to be able to continue therapy at home – Nebulisers usually a barrier to this
3. Morning Peak Flow 350 (Best 450, Evening 400)
4. Evening Peak Flow 400 (Best 450) – For Discharge:
 - >75% best/predicted
 - <25% diurnal variation
5. Still wheezy on auscultation
 - Not a contraindication as long as other criteria met



On discharge Ms JT is referred to chest clinic her medications, on discharge are:

Seretide 250 Evohaler (Fluticosone 250 mcg/Salmeterol 25mcg) ii BD

Monteleukast 10mg ON

Salbutamol ii PRN

What “step” does this place her on on the BTS/SIGN stepwise management algorithm?

1. Step 1
2. Step 2
3. Step 3
4. Step 4
5. Step 5



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Seretide 250 Evohaler (Fluticosone 250 mcg/Salmeterol 25mcg) ii BD

Monteleukast 10mg ON

Salbutamol ii PRN

What “step” does this place her on on the BTS/SIGN stepwise management algorithm?

1. Step 1
2. Step 2
3. Step 3
4. Step 4
5. Step 5

Patients should start treatment at the step most appropriate to the initial severity of their asthma. Check concordance and reconsider diagnosis if response to treatment is unexpectedly poor.

MOVE UP TO IMPROVE CONTROL AS NEEDED

MOVE DOWN TO FIND AND MAINTAIN LOWEST CONTROLLING STEP

Inhaled short-acting β_2 agonist as required

STEP 1

Mild intermittent asthma

Add inhaled steroid 200-800 mcg/day*
400 mcg is an appropriate starting dose for many patients

Start at dose of inhaled steroid appropriate to severity of disease.

STEP 2

Regular preventer therapy

1. Add inhaled long-acting β_2 agonist (LABA)
2. Assess control of asthma:
 - good response to LABA - continue LABA
 - benefit from LABA but control still inadequate - continue LABA and increase inhaled steroid dose to 800 mcg/day* (if not already on this dose)
 - no response to LABA - stop LABA and increase inhaled steroid to 800 mcg/day.* If control still inadequate, institute trial of other therapies, leukotriene receptor antagonist or SR theophylline

STEP 3

Initial add-on therapy

Consider trials of:

- increasing inhaled steroid up to 2000 mcg/day*
- addition of a fourth drug e.g. leukotriene receptor antagonist, SR theophylline, β_2 agonist tablet

STEP 4

Persistent poor control

Use daily steroid tablet in lowest dose providing adequate control

Maintain high dose inhaled steroid at 2000 mcg/day*

Consider other treatments to minimise the use of steroid tablets

Refer patient for specialist care

STEP 5

Continuous or frequent use of oral steroids

* BDP or equivalent

SYMPTOMS

vs

TREATMENT

Ms JT reports that despite this treatment regimen she still frequently wakes at night wheezy and is using her Salbutamol inhaler up to three times per day, most days.

Which of the following is not an appropriate management option?

1. Arrange Flu Vaccination
2. Send blood for IgE levels
3. Provide home Oxygen therapy
4. Add oral Prednisolone
5. Add an additional Steroid Inhaler



Ms JT reports that despite this treatment regimen she still frequently wakes at night wheezy and is using her Salbutamol inhaler up to three times per day, most days. Which of the following is **NOT** an appropriate management option?

1. Arrange Flu Vaccination
 - All asthmatics should receive annual seasonal influenza vaccination
2. Send blood for IgE levels
 - If her IgE is raised she meets the criteria for anti-IgE monoclonal antibody (Omalizumab) therapy
3. Provide home Oxygen therapy
 - Unlikely to be required in asthma
 - Home oxygen should only be used to treat chronic hypoxia
 - Hypoxia in asthmatics = Life Threatening Asthma \therefore Require Admission
4. Add oral Prednisolone
 - A possible option, either as a short course of high dose steroids (40-50 mg OD) or as a lower maintenance dose taking her to Step 5
5. Add an additional Steroid Inhaler
 - There is some scope for increasing her inhaled steroid within Step 4, this cannot be achieved with a combination inhaler as this would take her above the maximum dose of LABA but a steroid inhaler could be added. Were the question worded differently this would be the best/next option



- When you next see Ms JT in clinic her asthma is much better, she's married her weed dealer boyfriend and is pregnant with septuplets.
- In your wisdom you discharge her from clinic.
- You hear many years later that JT Jnr XII has gone on to be a professor of mathematics and pays for his mother to live in the best residential care Tower Hamlets can offer.
- All her other children lived happily ever after.

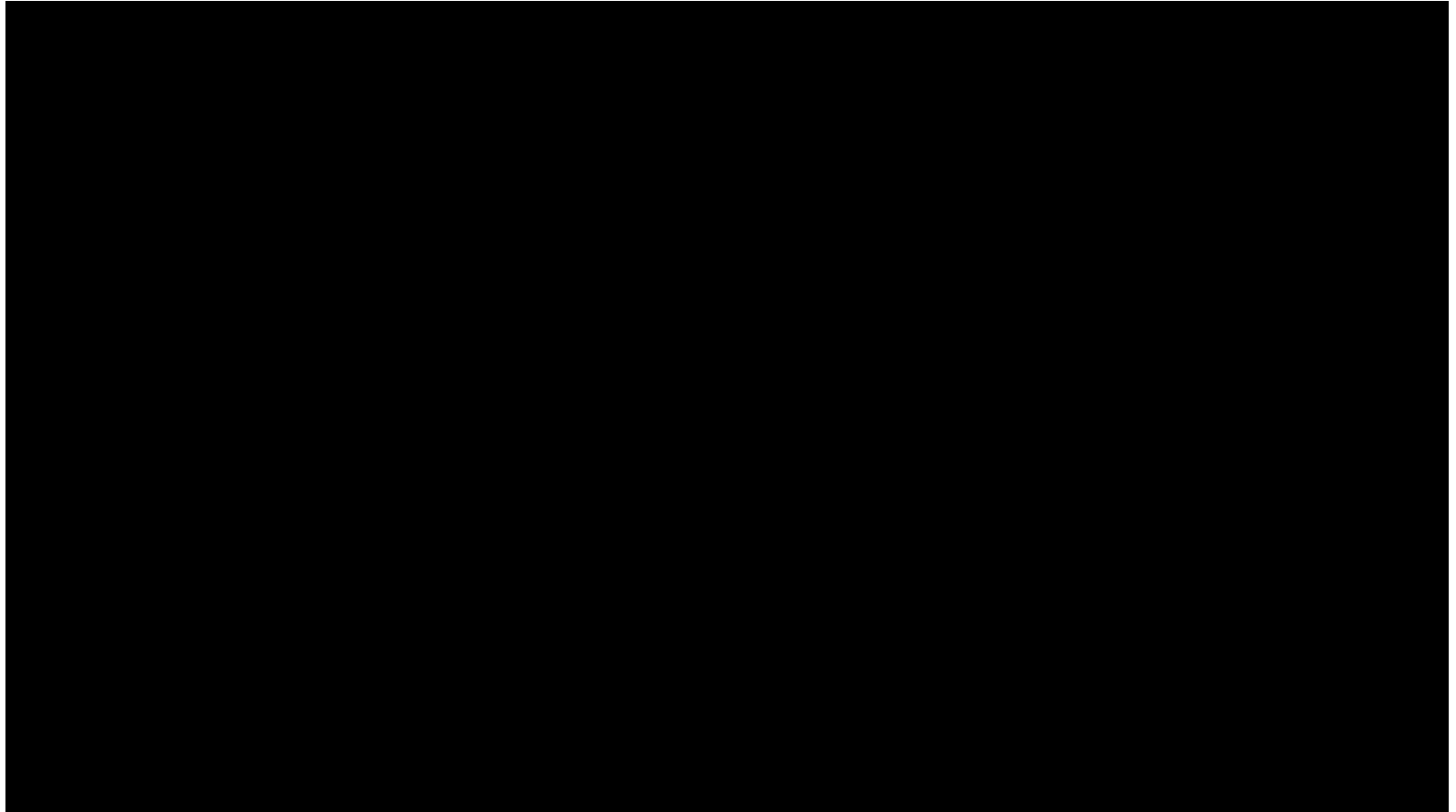
The End!



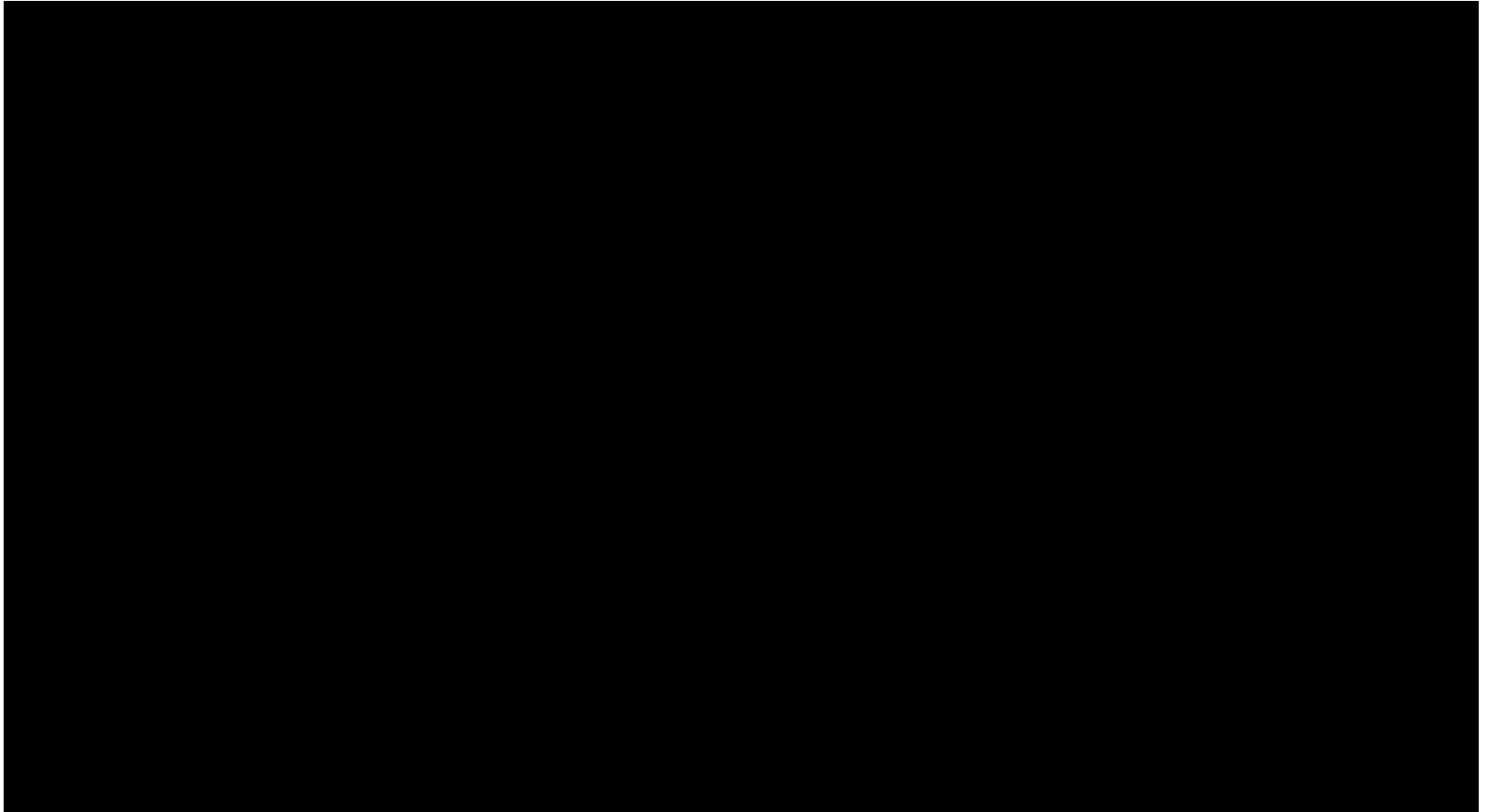
Inhaler Technique



Inhaler Technique



Peak Flow Technique

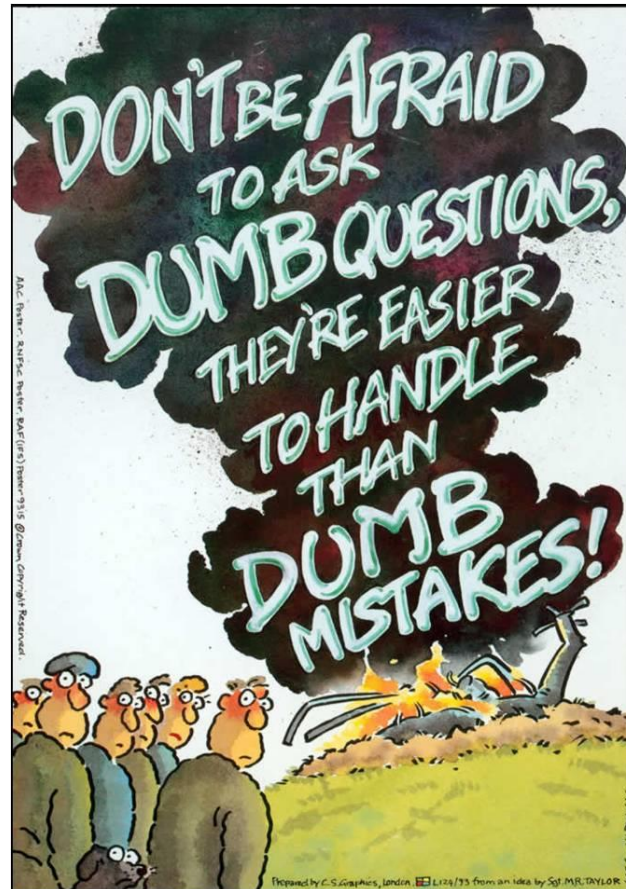


Asthma Summary

- The role of investigations in Asthma diagnosis and management
- Symptoms and signs of different severities of asthma exacerbation
- Emergency management of asthma
- Discharge management
- Stepwise asthma management
- Inhaler and Peak Flow Technique



Any Questions?



Case 2



Mr SA is referred to Chest Clinic. He is 55 years old and describes a three year history of slowly progressive breathlessness. He describes some exertional wheeze, but denies chest pain. His GP has treated him for three chest infections each of the last two years. He has smoked 15 cigarettes per day since the age of 15. What investigation should be performed first?

1. Chest Radiograph
2. CT Pulmonary Angiogram (CTPA)
3. Echocardiogram
4. Electrocardiogram
5. High Resolution CT (HRCT) Thorax
6. Spirometry
7. Sputum Culture



What this question is really asking – What is the most likely diagnosis?

- Mr SA is referred to Chest Clinic. He is 55 years old and describes a three year history of slowly progressive breathlessness.
 - He describes some exertional wheeze, but denies chest pain.
 - His GP has treated him for three chest infections each of the last two years.
 - He has smoked 15 cigarettes per day since the age of 15.
 - What investigation should be performed first?
1. Chest Radiograph = Pneumonia/PTx
 2. CT Pulmonary Angiogram (CTPA) = PE
 3. Echocardiogram = LVF/CCF
 4. Electrocardiogram = IHD
 5. High Resolution CT (HRCT) Thorax = ILD
 6. Spirometry = COPD/Asthma/ILD
 7. Sputum Culture = Pneumonia/Bronchiectasis/CF

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COPD



Calculate Mr SA's Pack Year History.

- Mr SA is 55 years old and describes a three year history of slowly progressive breathlessness. 1. 15
 - He describes some exertional wheeze, but denies chest pain. 2. 20
 - His GP has treated him for three chest infections each of the last two years. 3. 30
 - He has smoked 15 cigarettes per day since the age of 15. 4. 40
5. 50



Calculate Mr SA's Pack Year History.

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- His GP has treated him for three chest infections each of the last two years.
- He has smoked 15 cigarettes per day since the age of 15.

1. 15
2. 20
3. 30
4. 40
5. 50

Pack Years = Packs (of 20) smoked/day x Number of years smoked for

- $(15/20) \times (55-15)$
- $0.75 \times 40 = 30$



Which of the following spirometry patterns is most likely to represent Mr SA's?

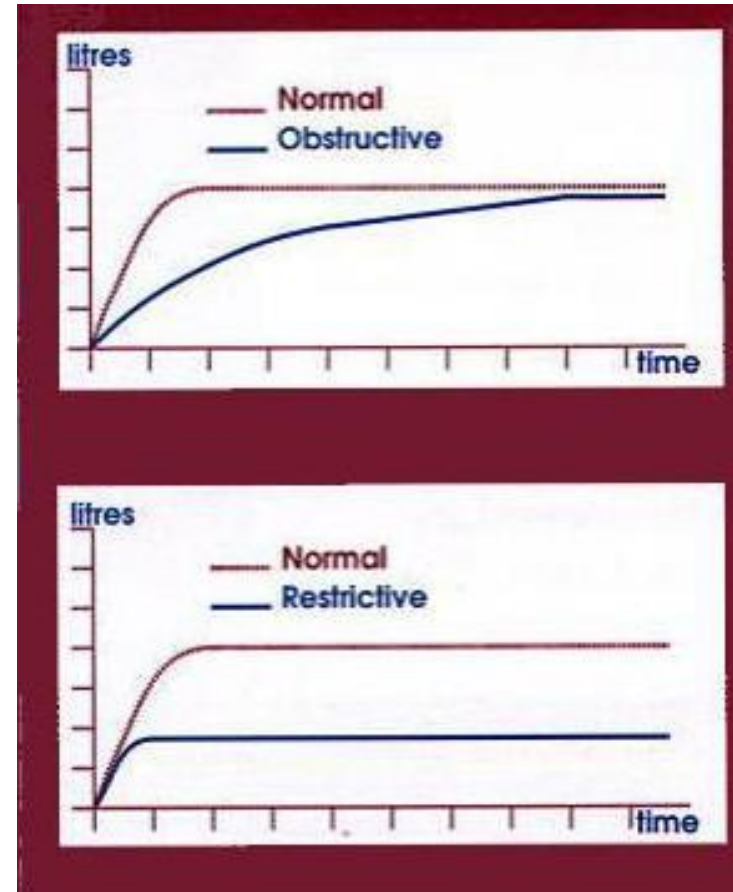
Answer	FEV ₁	FEV ₁ %	Post-Bronchodilator FEV ₁	FVC	FVC%	FEV ₁ :FVC
1	3	100	3.2	4	100	0.75
2	2	67	2.1	2.7	67	0.74
3	1.5	50	1.6	2.7	67	0.56
4	1.5	50	2	2.7	67	0.56
5	2.5	83	2.6	4.8	120	0.52

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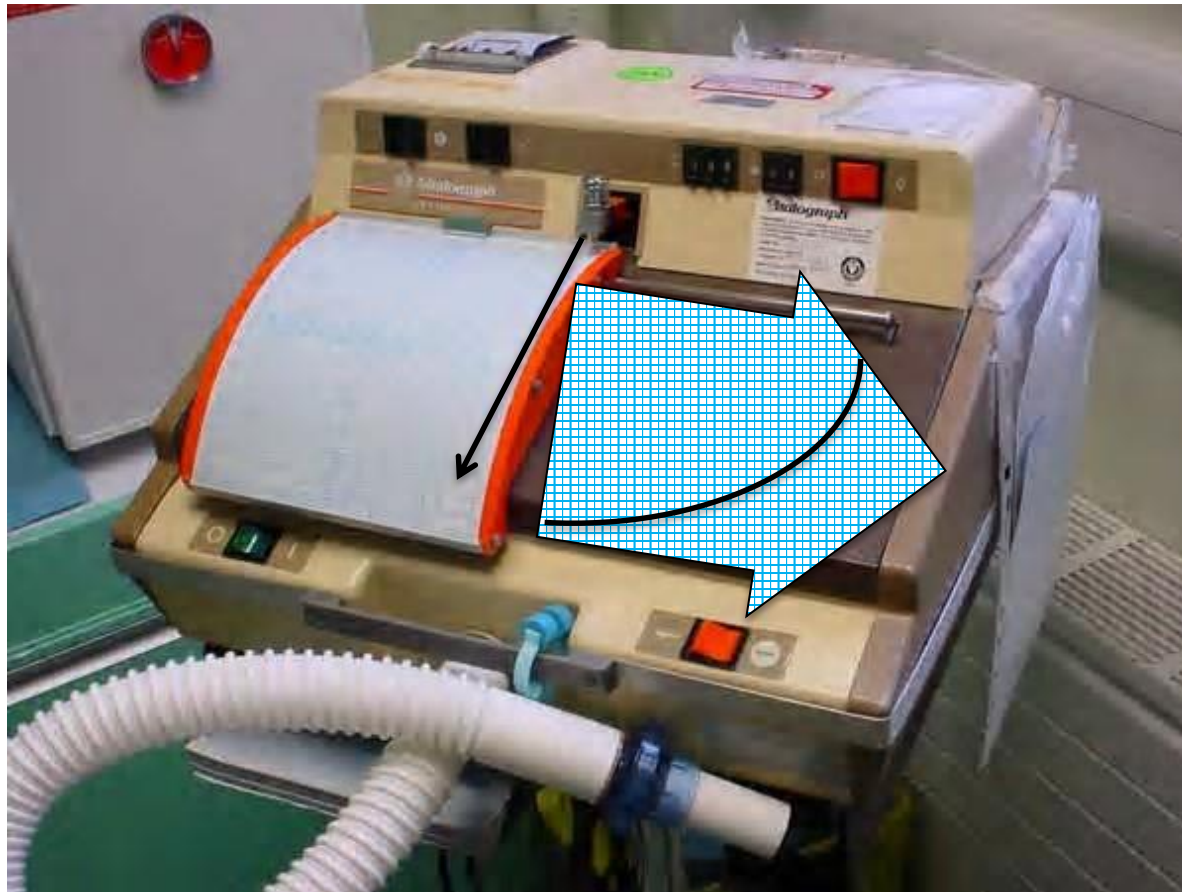
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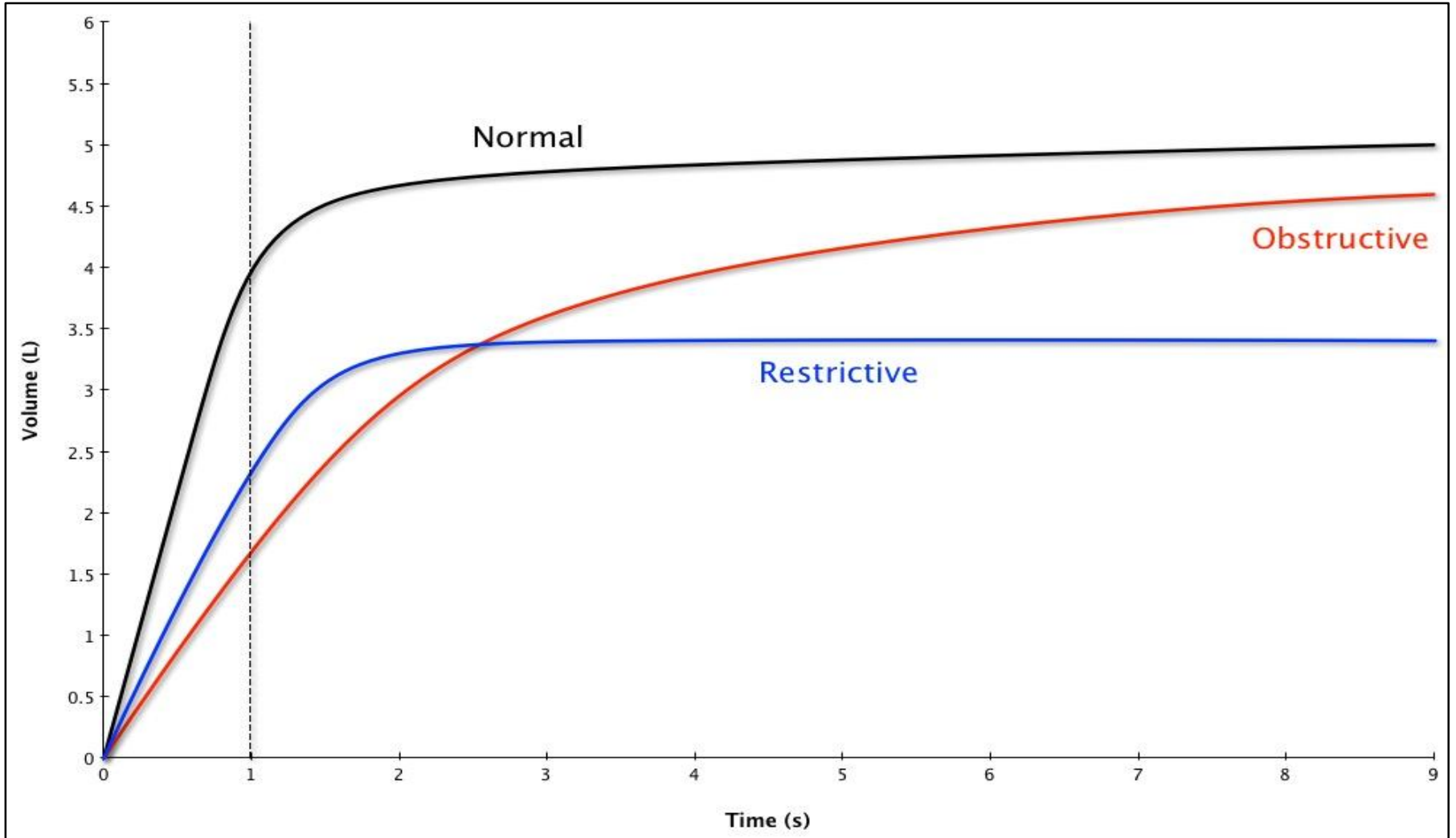
Spirometry

- Spirometry measures volume exhaled against time.
- FEV_1 (Forced Expiratory Volume) = Volume of Air Exhaled in 1s
- FVC (Forced Vital Capacity) = Total Volume of Air Exhaled
- Normal $\approx \geq 80\%$ Predicted
- Normally $\frac{3}{4}$ of Total Volume is Expired in 1st second
 - $\therefore FEV_1:FVC = 0.75$
- Harder to blow out = Obstruction
 - $FEV_1:FVC < 0.75$
- Less to blow out = Restriction
 - $FEV_1:FVC \geq 75\%$



Bellows Spirometer





Spirometry

Obstructive

- COPD – Fixed Obstruction
 - Use post-bronchodilator FEV₁
- Asthma – Variable Obstruction
 - >12% Predicted
 - >15% Baseline
 - >200ml
 - (PEFR >20%)
- Bronchiectasis
- Cystic Fibrosis

Restrictive

- Lung Parenchymal Disease
 - ILD
 - Sarcoid
 - Hypersensitivity Pneumonitis
- Pleural Disease
 - Diffuse Pleural Thickening
 - Pleural Effusion
 - Pneumothorax
- Chest Wall Disease
 - Kyphosis/Scoliosis
 - Ankylosing Spodylitis
- Neuromuscular Disease
 - MND
 - GBS

		NICE clinical guideline 12 (2004)	ATS/ERS 2004 ³	GOLD 2008 ⁴	NICE clinical guideline 101 (2010)
Post-bronchodilator FEV ₁ /FVC	FEV ₁ % predicted		Post-bronchodilator	Post-bronchodilator	Post-bronchodilator
< 0.7	≥ 80%		Mild	Stage 1 – Mild	Stage 1 – Mild*
< 0.7	50–79%	Mild	Moderate	Stage 2 – Moderate	Stage 2 – Moderate
< 0.7	30–49%	Moderate	Severe	Stage 3 – Severe	Stage 3 – Severe
< 0.7	< 30%	Severe	Very severe	Stage 4 – Very severe**	Stage 4 – Very severe**



Which of the following spirometry patterns is most likely to represent Mr SA's?

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1. Normal
2. Mild Restrictive Deficit
3. Moderate Obstructive Deficit – No significant reversibility \approx COPD
4. Moderate Obstructive Deficit – Significant Reversibility – Asthma
5. Obstructive Pattern within Normal Limits – ?Early COPD
= Mild COPD if Appropriate Symptoms

Based on Mr SA's History and Spirometry what is the most appropriate first line treatment?

- Mr SA is 55 years old and describes a three year history of slowly progressive breathlessness.
 - He describes some exertional wheeze, but denies chest pain.
 - His GP has treated him for three chest infections each of the last two years.
 - He has smoked 15 cigarettes per day since the age of 15.
1. Short acting β -agonist (SABA) e.g. Salbutamol as required (PRN)
 2. Short acting muscarinic antagonist (SAMA) e.g. ipratropium PRN
 3. Regular long acting β -agonist (LABA) e.g. Salmeterol
 4. Regular long acting muscarinic antagonist (LAMA) e.g. Tiotropium
 5. Regular LABA + LAMA
 6. Regular LABA + LAMA + Inhaled Corticosteroid (ICS)

FEV ₁	FEV ₁ %	Post-Bronchodilator FEV ₁	FVC	FVC%	FEV ₁ : FVC
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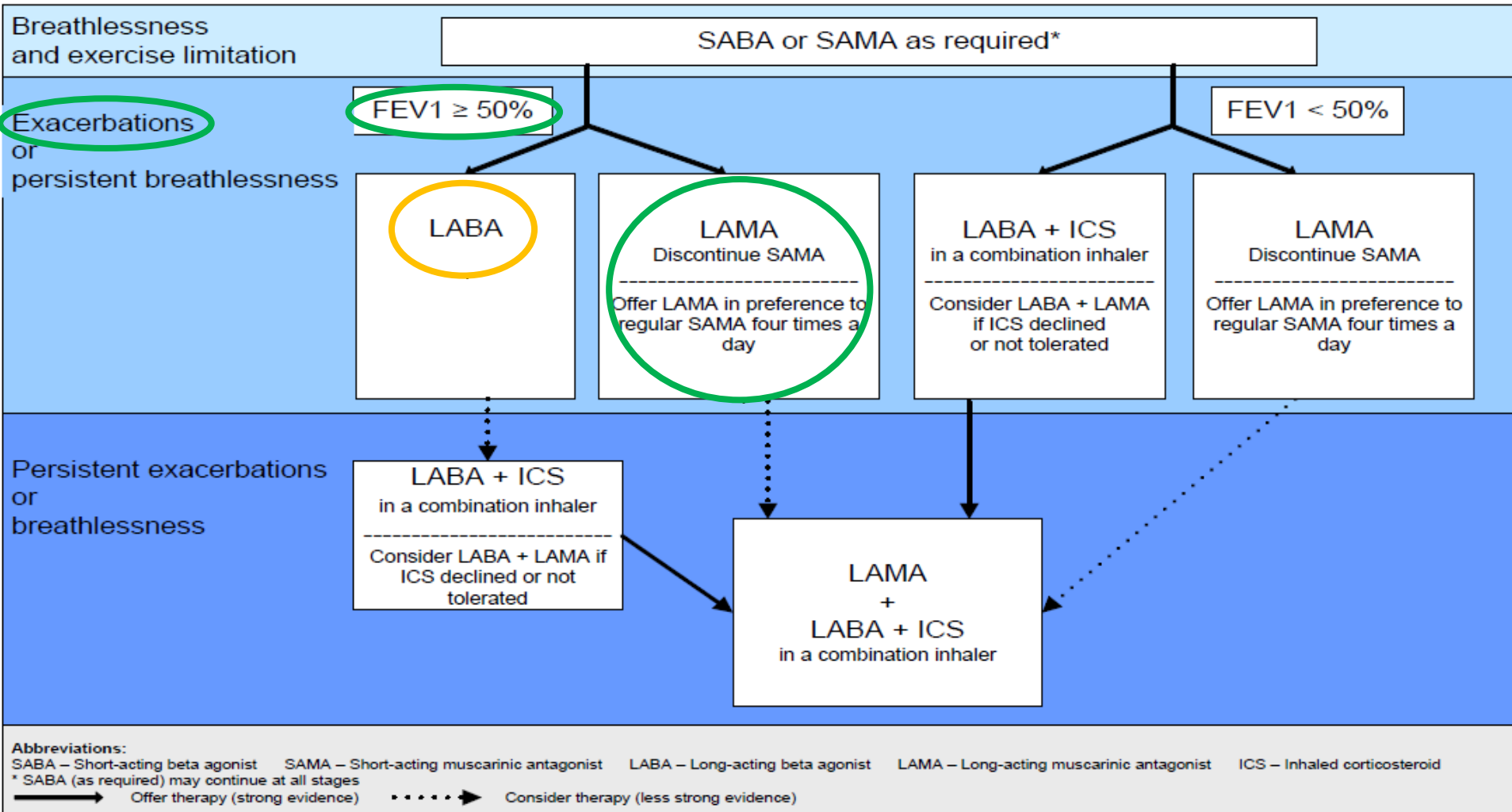
- Mr SA is 55 years old and describes a three year history of slowly progressive breathlessness.
 - He describes some exertional wheeze, but denies chest pain.
 - His GP has treated him for three chest infections each of the last two years.
 - He smoked 15 cigarettes per day from the age of 14 until last year.
1. Short acting β -agonist (SABA) e.g. Salbutamol as required (PRN)
 2. Short acting muscarinic antagonist (SAMA) e.g. ipratropium PRN
 3. Regular long acting β -agonist (LABA) e.g. Salmeterol
 4. Regular long acting muscarinic antagonist (LAMA) e.g. Tiotropium
 5. Regular LABA + LAMA
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Algorithm 2a: Use of inhaled therapies

Please note: This algorithm should be used within the wider context of the management of COPD, including algorithms 1, 2 and 3



You review Mr SA in clinic 3 months later, he has had two further exacerbations and tells you that he's now unable to get to the shops, which are 100m away, without stopping for a rest. On examination he has a respiratory rate of 16, oxygen saturations of 94% on air and scattered crepitations throughout his chest. Which of the following management options is least appropriate?

1. Flu vaccination
2. Add in a LABA/ICS combination inhaler to his LAMA
3. Long Term Oxygen Therapy (LTOT)
4. Nicotine replacement therapy
5. Pulmonary Rehabilitation



You review Mr SA in clinic 3 months later, he has had two further exacerbations and tells you that he's now unable to get to the shops, which are 100m away, without stopping for a rest. On examination he has a respiratory rate of 16, oxygen saturations of 94% on air and scattered crepitations throughout his chest. Which of the following management options is least appropriate?

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What this question is really asking is – Who benefits from each of the treatment options listed?

- | | |
|--|--|
| 1. Flu vaccination | 1. Should be offered to all with Chronic Respiratory, Cardiac or Liver Disease + Pregnant, Immune Suppressed and over 65's. Includes asthma and COPD |
| 2. Add in a LABA/ICS combination inhaler to his LAMA | 2. As per previous question |
| 3. Long Term Oxygen Therapy (LTOT) | 3. Only beneficial if: <ul style="list-style-type: none">▫ $\text{PaO}_2 < 7.3$ or▫ < 8 with polycythemia, peripheral oedema, pulmonary hypertension or nocturnal hypoxaemia |
| 4. Nicotine replacement therapy | 4. All smokers |
| 5. Pulmonary Rehabilitation | 5. All those with MRC Dyspnoea Score ≥ 3 <ul style="list-style-type: none">▫ MRC Scoring:<ol style="list-style-type: none">1. Strenuous Exercise2. Hurrying/Walking up slight hill3. Slower than others on the flat or stops on flat4. $< 100\text{m}$5. Housebound or dressing/washing |

The same question could be worded as – Which of the following is most likely to be life prolonging for Mr SA?

1. Flu vaccination
2. Maximum inhaled therapy (LABA/ICS and LAMA)
3. Long Term Oxygen Therapy (LTOT)
4. Smoking Cessation
5. Pulmonary Rehabilitation



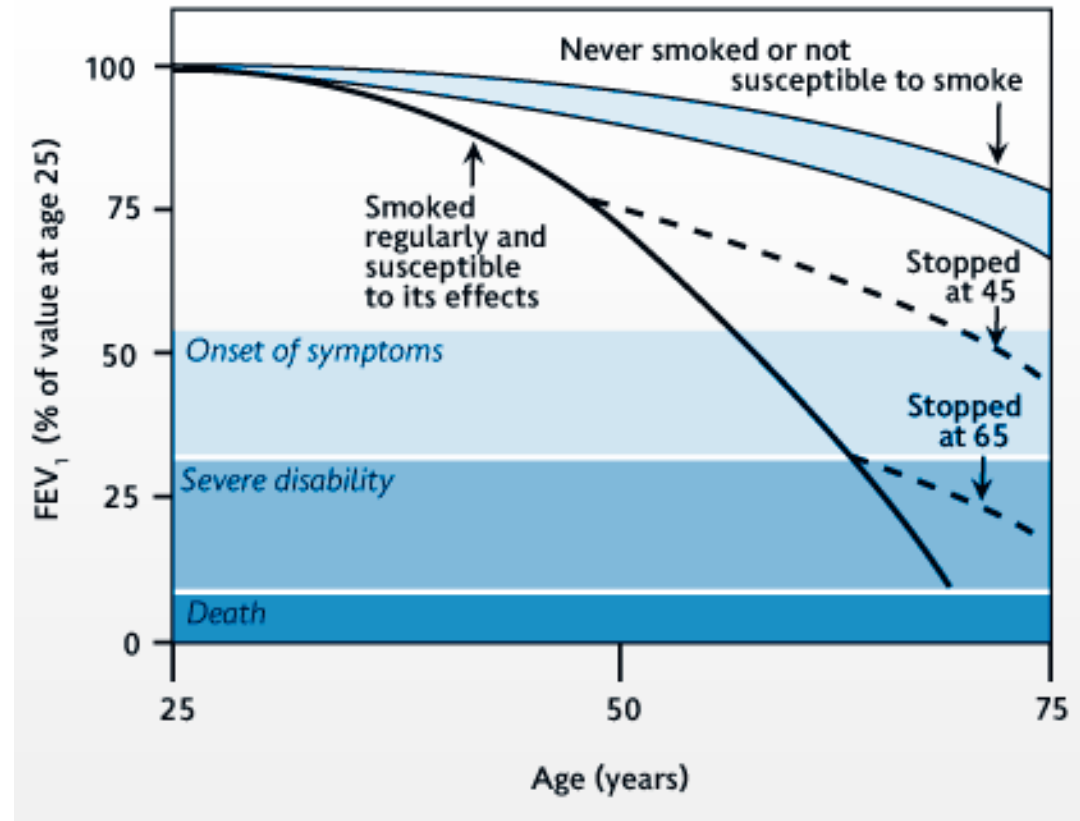
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1. Flu vaccination
2. Maximum inhaled therapy (LABA/ICS and LAMA)
3. Long Term Oxygen Therapy (LTOT)
 - Life prolonging as per previous criteria and used ≥ 15 hours/day
4. Smoking Cessation
5. Pulmonary Rehabilitation



Fletcher C, Peto R. The natural history of COPD
BMJ, 1977;1;1645-1648

Or as – Which of the following is the most cost effective management option in COPD?

1. Flu vaccination
2. Add in a LABA/ICS combination inhaler to his LAMA
3. Long Term Oxygen Therapy (LTOT)
4. Nicotine replacement therapy
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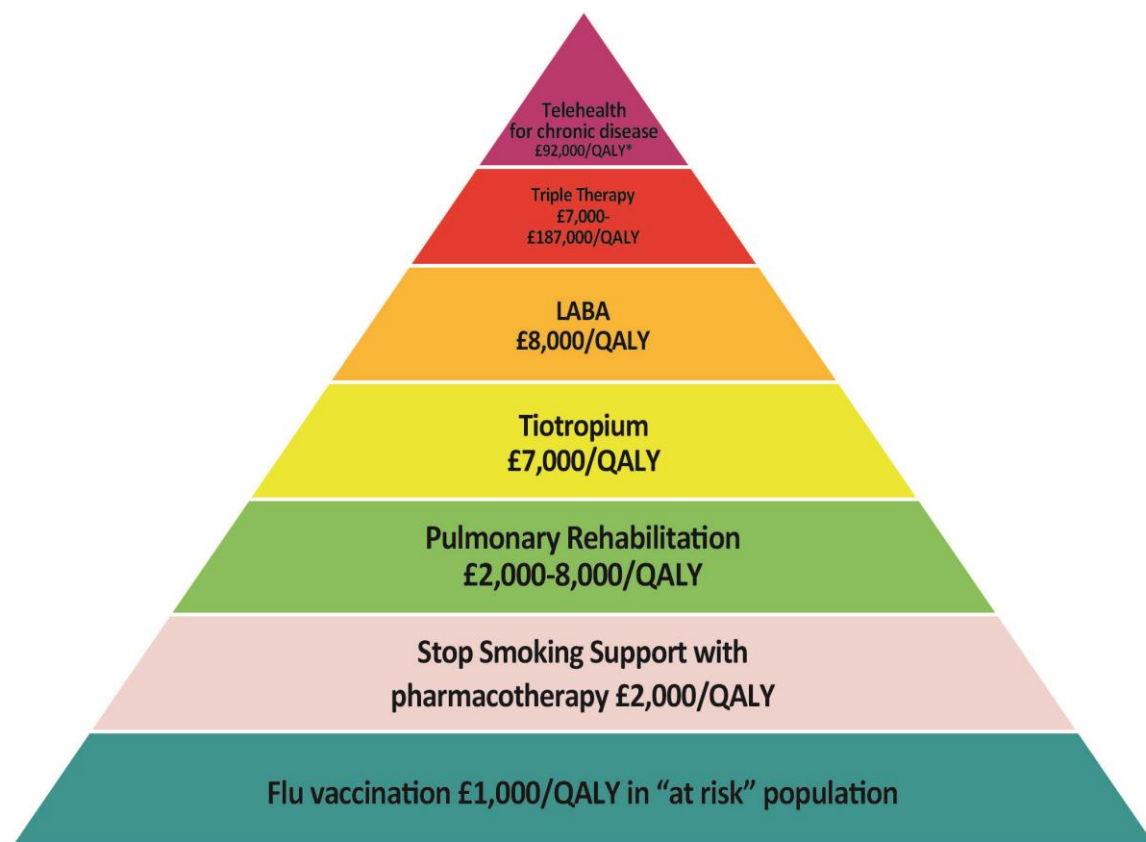
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London Respiratory Team Report
2010-2013

A few weeks later you are on-call when Mr SA presents to A&E with worsening cough, purulent sputum and breathlessness for the last week. His oxygen saturations are 90% on air. Which of the following is least appropriate in his management?

1. Antibiotics
2. Nebulised Salbutamol
3. Nebulised Ipratropium
4. Oral Steroids
5. Oxygen



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A few weeks later you are on-call when Mr SA presents to A&E with worsening cough, purulent sputum and breathlessness for the last week. His oxygen saturations are 90% on air. Which of the following is **LEAST** appropriate in his management?

1. Antibiotics
 2. Nebulised Salbutamol
 3. Nebulised Ipratropium
 4. Oral Steroids
 5. **Oxygen**
- Oxygen should only be used to treat hypoxia.
 - In patients who are chronically hypoxic attempting to achieve a “normal” level of oxygenation may suppress hypoxic drive resulting in hypercapnea
 - The target range for oxygen saturations in this group is 88-92%
 - Mr SA’s Saturations are within this range and therefore oxygen is not required



When you get to A&E you find out that Mr SA had been given 15 l/min of oxygen in the ambulance and now on air has the following blood gas. You treat him with nebulised salbutamol and ipratropium, oral prednisolone and antibiotics and maintain his oxygen saturations at 90% on air, but one hour later he has the following ABG. How would you define this blood gas abnormality?

	Normal	Baseline	1 Hour
pH	7.35-7.45	7.25	7.27
pCO ₂	4-6	8.8	8.4
pO ₂	9-12	8.6	8.2
HCO ₃	20-24	28.4	29.0
BE	-2-2	4.5	4.9

1. Metabolic Acidosis
2. Respiratory Alkalosis
3. Uncompensated Respiratory Acidosis
4. Fully Compensated Respiratory Acidosis
5. Partially Compensated Respiratory Acidosis



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What is the most appropriate next step in management?

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1. Intubation and ventilation
2. iv Aminophylline
3. iv Doxapram
4. iv Hydrocortisone
5. Non-invasive ventilation (NIV)

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What is the most appropriate next step in management?

1. Intubation and ventilation
 2. iv Aminophylline
 3. iv Doxapram
 4. iv Hydrocortisone
 5. **Non-invasive ventilation (NIV)**
1. Indicated if pH <7.25
 2. Mixed advice:
 - NICE (COPD 2010) Can be used as an adjunct to other bronchodilators
 - BTS (NIV 2008) Not recommended
 3. Respiratory stimulant only recommended if NIV unavailable/inappropriate
 4. No advantage over oral steroids
 5. Recommended in COPD if:
 - Persistent Respiratory Acidosis
 - pH 7.25-7.35
 - After 1 hour of maximal medical therapy
 - ↓Mortality
 - ↓Intubation Rate

- Mr SA responds well to the NIV, being weaned off it over the next three days.
- He is discharged home a week later.
- He successfully gives up smoking and becomes the greatest success Tower Hamlets Pulmonary Rehab have ever seen winning the 2015 London Marathon win a new world record time!



COPD Summary

- Differential diagnosis of breathlessness
- Calculate a patient's pack years
- Role of spirometry in diagnosing COPD and measuring severity
- Stepwise choice of treatment in COPD
- Role of LTOT, Smoking Cessation, NRT and Vaccination
- Management of an acute exacerbation
- Recognition and management of Type II Respiratory Failure



Any Questions?



VTE



You are the on-call F1 and are asked to see Miss CH a 33 year old lady referred by her GP with a swollen right leg.

Which two of the following are not major risk factors for DVT?

1. Hospitalisation
2. Long haul flight
3. Lower limb fracture
4. Oral Contraceptive Pill (OCP)
5. Pregnancy
6. Previous DVT or PE
7. Recent knee replacement

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VTE Risk Factors

Major (RR 5-20)

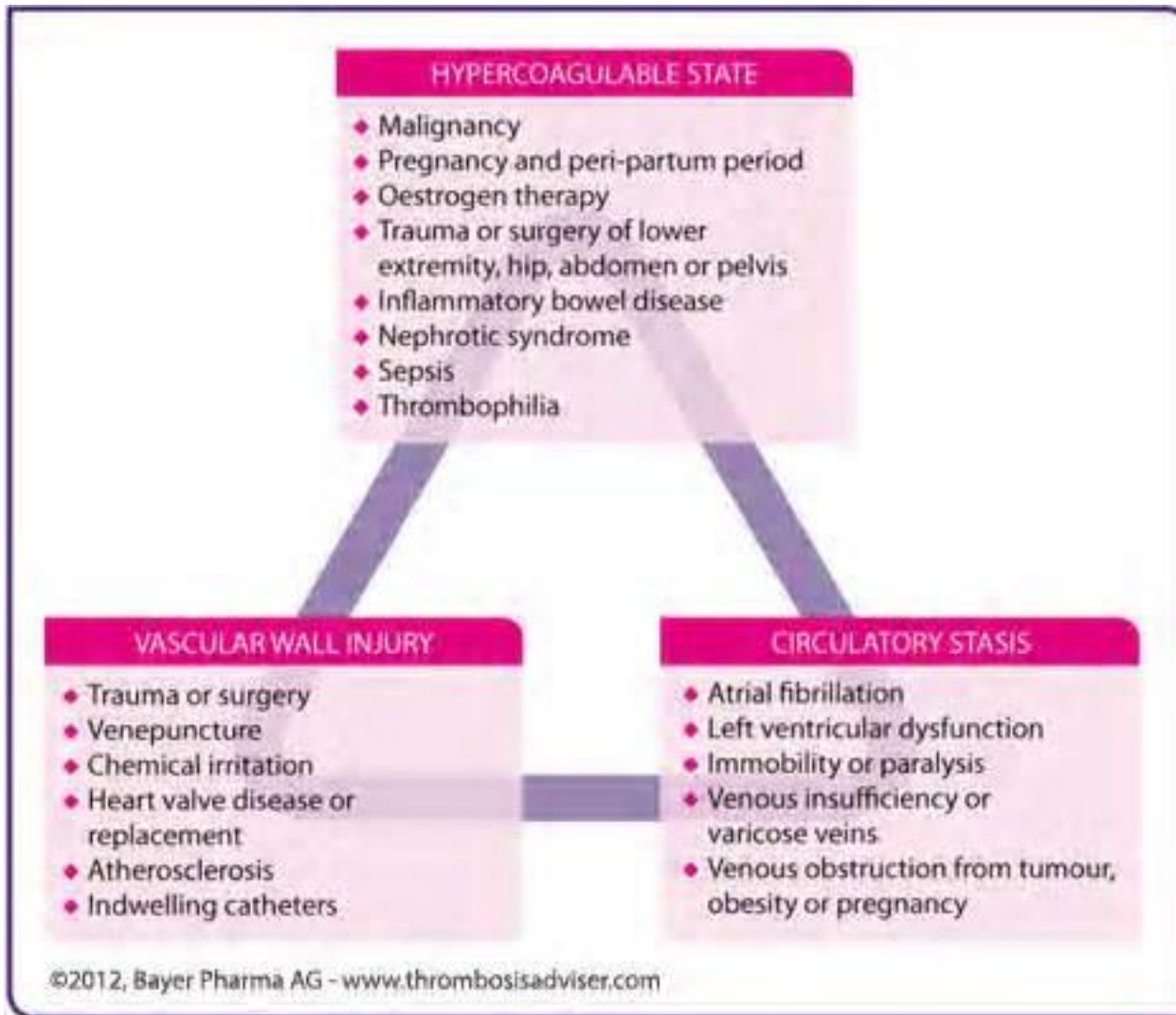
- Surgery
 - Major Abdominal/Pelvic
 - Hip/Knee Replacement
- Obstetric
- Lower Limb:
 - Fracture
 - Varicose Veins
- Malignancy – Esp:
 - Abdominal/Pelvic
 - Advanced/Metastatic
- ↓Mobility
 - Hospitalisation
 - Institutional Care
- Previous VTE

Minor (RR 2-4)

- Cardiovascular Disease
- Oestrogens (OCP, HRT)
- Thrombotic Disorders
 - Usually need to interact with another risk factor
- Long Distance Sedentary Travel
- Obesity



Think of Virchow's Triad



Other than Risk Factors which other element in the history make DVT more likely than alternative diagnoses?

1. Both legs affected equally
2. Erythema of affected limb
3. Non-pitting oedema of affected limb
4. Swelling of entire leg



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1. Both legs affected equally
 2. Erythema of affected limb
 3. Non-pitting oedema of affected limb
 4. Swelling of entire leg
1. Usually unilateral
 2. In keeping with cellulitis – May coexist
 3. In keeping with lymphoedema
 4. Swelling usually dependent in oedema states

You suspect Miss CH of having a DVT, you cannot arrange imaging until the next day, what, if any, management would you instigate in the meantime?

1. None, treatment should not be started without a definitive diagnosis
2. Aspirin
3. Compression (TED) Stockings
4. Low Molecular Weight Heparin
5. Unfractionated Heparin
6. Warfarin

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DVT Management

- If you suspect DVT and cannot arrange imaging within 4 hours treatment should be initiated
- LMWH is the treatment of choice
 - Rapid onset of action
 - Fixed (weight based) dosing
 - Predictable duration of action
 - Subcutaneous Injections
 - Not easily reversible
- Aspirin – No benefit
- Warfarin – Good long term option
 - Requires loading
 - Variable dose – Requires monitoring
 - Oral
 - Multiple Interactions
- Unfractionated Heparin
 - Continuous Infusion
 - Rapidly Reversible
- TEDS – Preventative – Not Treatment



Miss CH is confirmed to have a DVT so you arrange for her to be started on Warfarin, which blood test is used to monitor her response to warfarin?

1. APTT
2. D-Dimer
3. Fibrinogen
4. INR
5. Platelets



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1. Monitoring of Heparin
2. Clotting break down product used in assessment of VTE
3. Protein involved in clotting
 - ↑ in Inflammation
 - ↓ in DIC
4. = International Normalised Ratio
5. Blood cell involved in clotting

After starting Miss CH on Warfarin what target range of INR should be aimed for?

1. 0-1
2. 1-2
3. 2-3
4. 3-4
5. 4-5



After starting Miss CH on Warfarin what target range of INR should be aimed for?

1. 0-1
2. 1-2
3. 2-3
4. 3-4
5. 4-5

- An INR of 2-3 provides the best balance of protection against thrombosis without excessively increased bleeding risk.
- An INR of 3-4 is the target range for metallic heart valves where there is a higher risk of thrombosis.



Miss CH is confirmed to have a DVT so you arrange for her to be started on Warfarin, which of the following does not interact with Warfarin?

1. Alcohol
2. Amiodarone
3. Clarithromycin
4. Clopidogrel
5. Cranberry Juice
6. Phenytoin
7. Rifampicin
8. Vitamin K

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Warfarin Metabolism

- Warfarin is metabolised via the cP450 system
- Drugs that induce or inhibit cP450 will alter Warfarin metabolism
- cP450 Inhibitors block Warfarin Metabolism →
 - ↑Warfarin levels
 - ↑INR
 - ↑Bleeding Risk
- cP450 Inducers enhance Warfarin Metabolism →
 - ↓Warfarin levels
 - ↓INR
 - ↑Risk of clotting
- Enzyme Inhibitors
 - Chronic Alcohol
 - Amiodarone
 - Clarithromycin/Erythromycin
 - Cranberry and Citrus Juices
- Enzyme Inducers
 - Acute Alcohol
 - Phenytoin
 - Rifampicin
- Aspirin and/or Clopidogrel will increase the risk of bleeding on Warfarin, but this is a direct effect, not due to a drug interaction



You are on-call in A&E 3 weeks later when Miss CH attends with sudden onset left sided chest pain, you note that her INR has been sub-therapeutic for the last week. Which of the following descriptions is most consistent with pain caused by pulmonary embolism?

1. Burning pain radiating to the throat
2. Crushing pain radiating down the left arm
3. Sharp pain worse on bending forward
4. Sharp pain worse on breathing in and coughing
5. Sharp pain worse on specific movements

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 3. Sharp pain worse on bending forward
 4. Sharp pain worse on breathing in and coughing
 5. Sharp pain worse on specific movements
1. Oesophageal Reflux
 2. Cardiac Ischemia
 3. Pericarditis
 4. Pleuritic Pain
 5. Musculoskeletal Pain



Which of the following is least likely to present with pleuritic pain?

1. Fractured Rib
2. Pneumonia
3. Pneumothorax
4. Pulmonary Embolus
5. Viral Lower Respiratory Tract Infection



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Which scoring system might help you assess the likelihood that Miss CH is suffering from a pulmonary embolus?

1. APACHE
2. CURB65
3. HASBLED Score
4. Rockall Risk Score
5. Wells Score



Which scoring system might help you assess the likelihood that Miss CH is suffering from a pulmonary embolus?

1. APACHE
 2. CURB65
 3. HASBLED Score
 4. Rockall Risk Score
 5. Wells Score
1. ITU Mortality
 2. Pneumonia
 3. Risk of bleeding on Warfarin
 4. UGI Bleed Risk Stratification
 5. Assessment of Clinical Probability of VTE
 - Number of versions
 - Different Wells scores for DVT and PE
 - Two level scores currently recommended

Wells Scores

DVT	
Clinical feature	Points
Active cancer (treatment ongoing, within 6 months, or palliative)	1
Paralysis, paresis or recent plaster immobilisation of the lower extremities	1
Recently bedridden for 3 days or more or major surgery within 12 weeks requiring general or regional anaesthesia	1
Localised tenderness along the distribution of the deep venous system	1
Entire leg swollen	1
Calf swelling at least 3 cm larger than asymptomatic side	1
Pitting oedema confined to the symptomatic leg	1
Collateral superficial veins (non-varicose)	1
Previously documented DVT	1
An alternative diagnosis is at least as likely as DVT	-2
Clinical probability simplified score	
DVT <i>likely</i>	2 points or more
DVT <i>unlikely</i>	1 point or less

PE	
Clinical feature	Points
Clinical signs and symptoms of DVT (minimum of leg swelling and pain with palpation of the deep veins)	3
An alternative diagnosis is less likely than PE	3
Heart rate > 100 beats per minute	1.5
Immobilisation for more than 3 days or surgery in the previous 4 weeks	1.5
Previous DVT/PE	1.5
Haemoptysis	1
Malignancy (on treatment, treated in the last 6 months, or palliative)	1
Clinical probability simplified scores	
PE <i>likely</i>	More than 4 points
PE <i>unlikely</i>	4 points or less



What is the best investigation for Mrs CH?

1. Chest Radiograph
2. CT Pulmonary Angiogram (CTPA)
3. D-Dimer
4. Doppler Ultrasound of both legs
5. Echocardiogram
6. Ventilation/Perfusion (V/Q) scan
7. None of the above

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 4. Doppler Ultrasound of both legs
 5. Echocardiogram
 6. Ventilation/Perfusion (V/Q) scan
 7. **None of the above**
1. First test – Easily excludes some differentials
 2. Most sensitive and specific
 - Provides additional information on potential differential diagnoses
 3. Good negative predictive value
 - Will be positive here as known DVT
 4. Can be utilised to avoid radiation exposure
 - If positive no need to investigate further
 - Will be positive here as known DVT
 5. Useful in massive PE – Show acute right heart strain
 6. Less specific than CTPA
 - But also less radiation exposure
 - Requires normal CXR

Mrs CH collapses on her way to the CT scanner, when you arrive she is maintaining her own airway, has a respiratory rate of 40 and a weak pulse. What is the treatment of choice?

1. Adrenaline
2. Cardiopulmonary Resuscitation (CPR)
3. Heparin
4. Low Molecular Weight Heparin
5. Intravenous Thrombolysis
6. Warfarin



Mrs CH collapses on her way to the CT scanner, when you arrive she is maintaining her own airway, has a respiratory rate of 40 and a weak pulse. What is the treatment of choice?

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 3. Heparin
 4. Low Molecular Weight Heparin
 5. Intravenous Thrombolysis
 6. Warfarin
- Indications for thrombolysis:
 - Hypotension
 - Acidosis
 - Cardiac Arrest



- Thanks to your swift intervention Mrs CH survives her peri-arrest.
- As a sign of her gratitude she commends you to hospital's Chief Executive and donates a million pounds to the hospital which the Chief Executive naturally uses to pay for a new executive suit for himself and the rest of the management team!



VTE Summary

- List risk factors for VTE
- Describe symptoms and signs of DVT
- Treatment of DVT & PE including Massive PE
- Differential diagnosis of Chest Pain/Pleuritic Chest Pain
- Wells Scoring
- Role of different investigations for PE



Any Questions?

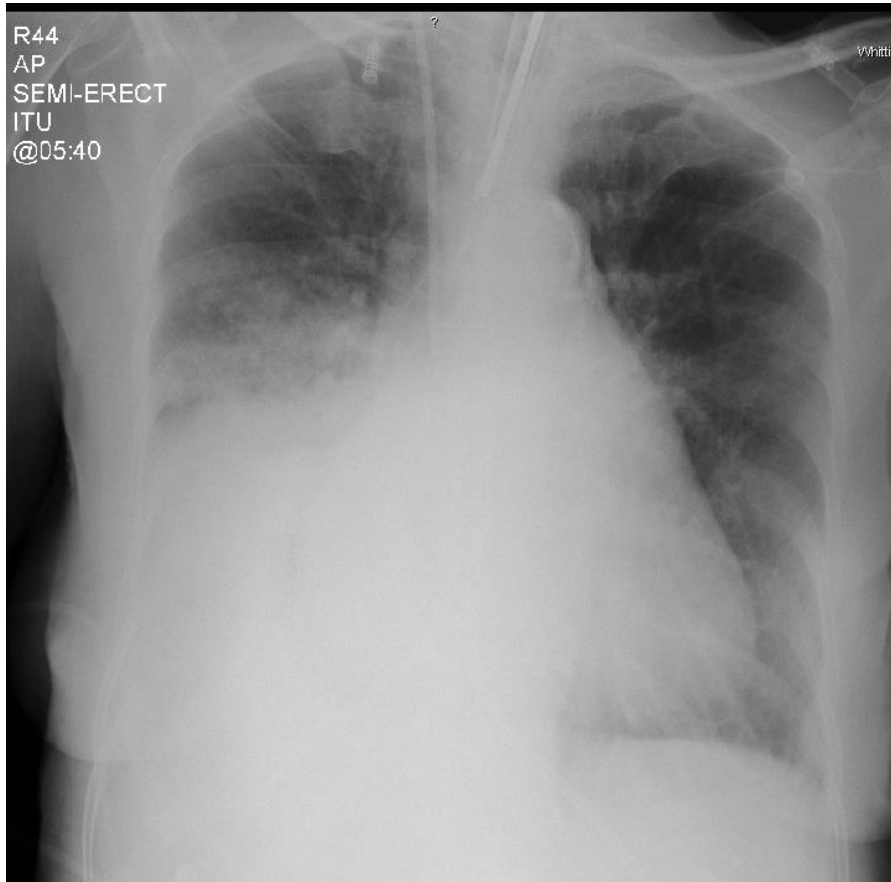


 **SIMPLY**
RESPIRATORY

Pneumonia

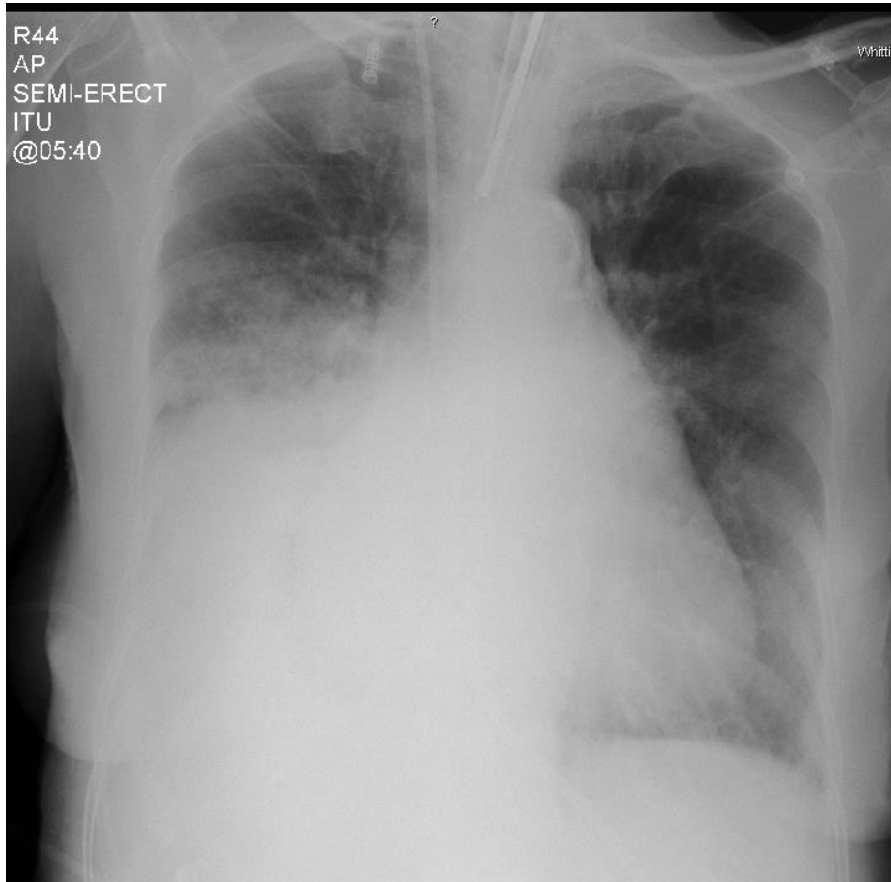


You are asked to see Mrs DR in A&E a 64 year old lady with known severe COPD, with a 2 week history of increasing lethargy and 4 days of cough, fever and purulent sputum production. She has right basal crepitations on examination and her chest radiograph is shown. Which of the following must be present to confirm the diagnosis of pneumonia?



1. Breathlessness
2. Pleuritic chest pain
3. Tachypnoea
4. Fever
5. New radiographic shadowing

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1. Breathlessness
 2. Pleuritic chest pain
 3. Tachypnoea
 4. Fever
 5. **New radiographic shadowing**
- Why is this not the real Mrs DR's x-ray?

Diagnosis of Pneumonia:

“Symptoms and signs consistent with an acute lower respiratory tract infection associated with new radiographic shadowing for which there is no other explanation.”

Symptoms:

- Localised :
 - Cough + ≥ 1 of:
 - Pleural pain
 - Dyspnoea
 - Tachypnoea
- Systemic:
 - Sweating, Fevers, Shivers, Aches and Pains and/or
 - Fever $\geq 38^{\circ}\text{C}$

Signs:

- New + Focal chest signs

Radiographic changes:

- New radiographic shadowing
 - No other explanation



On clinical examination you find that Mrs DR has a temperature of 38.8°C, pulse of 110, BP of 110/70, respiratory rate of 22, oxygen saturations of 80% on air and an AMTS of 9/10. What further information do you require to adequately stratify Mrs DR's risk of death on this admission?

1. Arterial blood gas
2. C-reactive protein
3. Glasgow coma score
4. White cell count
5. Blood urea



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1. Arterial blood gas
2. C-reactive protein
3. Glasgow coma score
4. White cell count
5. Blood urea

Mrs DR's Urea is 6.2 (NR 3-7.5) what is her CURB65 score?

- On clinical examination you find that Mrs DM has:
 - Temperature 38.8°C
 - Pulse 110
 - BP 110/70
 - Respiratory rate 22
 - Oxygen saturations 80% on air
 - AMTS of 9/10

- 1.
- 2.
- 3.
- 4.
- 5.
- 0.



Mrs DR's Urea is 6.2 (NR 3-7.5) what is her CURB65 score?

- On clinical examination you find that Mrs DM has:
 - Temperature 38.8°C
 - Pulse 110
 - BP 110/70
 - Respiratory rate 22
 - Oxygen saturations 80% on air
 - AMTS of 9/10
- 1.
 - 2.
 - 3.
 - 4.
 - 5.
 - 0.



CURB65

CURB65

- **C** – New **C**onfusion (AMTS ≤ 8)
- **U** – \uparrow **U**rea > 7 mmol/l
- **R** – \uparrow **R**espiratory **R**ate ≥ 30 /min
- **B** – \downarrow **B**lood Pressure
SBP < 90 mmHg and/or
DBP ≤ 60 mmHg
- **65** – \uparrow Age ≥ 65

Mrs DR

- **C** **x** - AMTS 9/10
- **U** **x** - Urea 6.2
- **R** **x** - RR 22
- **B** **x** - 110/70
- **65** **x** - 64

Based on Mrs DR's CURB65 score what is the recommended management in her case?

1. Oral antibiotics at home
2. Oral antibiotics in hospital on a ward
3. Intravenous (iv) antibiotics in hospital on a ward
4. Iv antibiotics on a High Dependency Unit (HDU)
5. Iv antibiotics in hospital on Intensive Care (ITU)



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Alternative Question: Given Mrs DR's overall clinical picture how would you manage her case?

- 64 year old lady
- Known severe COPD
- 2 week history of ↑lethargy
- 4 days:
 - Cough
 - Fever
 - Purulent sputum
- Right basal crepitations
- Temperature 38.8°C
- Pulse 110
- BP 110/70
- Respiratory rate 22
- Oxygen saturations 80% on air
- AMTS of 9/10

1. Oral antibiotics at home
2. Oral antibiotics in hospital on a ward
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Alternative Question: Given Mrs DR's overall clinical picture how would you manage her case?

1. Oral antibiotics at home
2. Oral antibiotics in hospital on a ward
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Pneumonia Management

- CURB65
 - 0-1 – Oral Antibiotics at Home
 - 2 – Oral Antibiotics as Inpatient
 - 3+ – Admit – IV Antibiotics + urgent senior review
 - 4-5 – Admit – IV Antibiotics + Critical Care (ITU/HDU) Review
- Oxygen – Aim for Target Saturations
- i.v. Fluids, Analgaesia & DVT Prophylaxis
- Chest Physio/sitting out + Nutritional support
- Smoking Cessation

- Clinical acumen is as good as CURB65 score
- Co-morbidities and Social Factors should be considered
 - Severe COPD
 - Severe Hypoxia

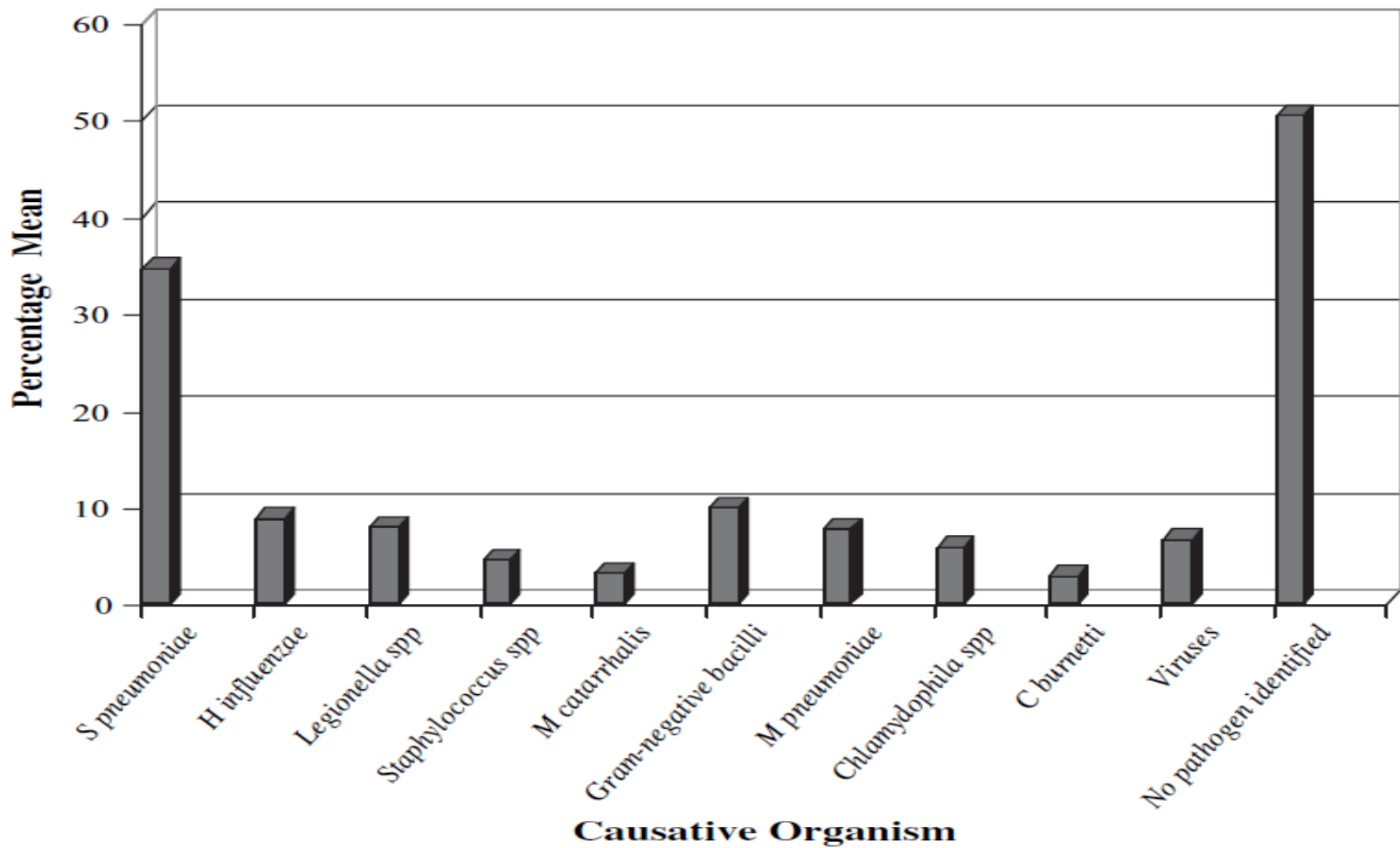


What is the most likely pathogen in Mrs DR's case?

1. *Haemophilus influenzae*
2. *Legionella*
3. *Mycoplasma pneumoniae*
4. *Staph. Aureus*
5. *Strep. Pneumoniae*
6. Viral

What is the most likely pathogen in Mrs DR's case?

1. *Haemophilus influenzae*
2. *Legionella*
3. *Mycoplasma pneumoniae*
4. *Staph. Aureus*
5. *Strep. Pneumoniae*
6. Viral



Thorax 2012;67:71-79

H.influenzae may have increased incidence in COPD,
but *S.pneumoniae* is still statistically more likely



Which investigation has the best sensitivity for diagnosing *Strep. Pneumoniae* in this case?

1. Blood Cultures
2. Sputum Gram Stain
3. Sputum Culture
4. Sputum AFB
5. Urinary Antigen



Which investigation has the best sensitivity for diagnosis *Strep. Pneumoniae* in this case?

1. Blood Cultures <25%
2. Sputum Gram Stain Low
3. Sputum Culture <20%
4. Sputum AFB Test for TB
5. Urinary Antigen >80% (also quick)

Despite treatment Mrs DR develops a pleural effusion, which you find on investigation to be a simple parapneumonic effusion.

Which of the following options is most likely to represent her pleural fluid biochemistry?

Option	pH	Protein	LDH	Glucose
1	7.1	26	Low	3
2	7.1	34	High	3
3	7.3	26	Low	5
4	7.3	34	Low	5
5	7.3	34	High	5

Despite treatment Mrs DR develops a pleural effusion, which you find on investigation to be a simple parapneumonic effusion.

Which of the following options is most likely to represent her pleural fluid biochemistry?

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5	7.3	34	High	5

Pleural Fluid Analysis

Parameter	Transudate	Borderline	Exudate
Protein	<25	25-35	>35



Parameter	Transudate	Exudate Any 1 = Exudate
LDH (Absolute)	<2/3 UL Normal	>2/3 UL Normal
LDH (Relative)	<0.6 Serum level	>0.6 Serum level
Protein (Relative)	<0.5 Serum level	>0.5 Serum level

Pleural Fluid Analysis

Exudates – “Leaky Pleura”

- Local Inflammation:
 - Infection:
 - Pneumonia
 - TB
 - Fungal
 - Malignancy
 - PE
 - Benign Asbestos Effusion
- Systemic Inflammation
 - RA/Auto-immune
 - Pancreatitis
- Other:
 - Post-MI/CABG
 - Yellow Nail Syndrome
 - Drugs (MTX, Pheny, Nitro)

Transudates – “Thin Fluid”

- Failures:
 - Cardiac
 - Liver
 - Renal
 - Nephrotic Syndrome
 - Peritoneal Dialysis
 - Thyroid – Hypothyroidism
- Hypoalbuminaemia



Pneumonia Associated Effusions

	Empyema	Complex Parapneumonic	Simple Parapneumonic
pH	Frank Pus	<7.2	>7.2

- Empyemas and Complex Parapneumonic effusions require drainage
- Simple parapneumonic effusions usually resolve with treatment of the underlying infection
- Other causes of acidic (pH <7.3) effusion:
 - Malignancy
 - TB
 - Connective Tissue Disease
 - Oesophageal Rupture
- Glucose usually mirrors pH

So what does each of these options represent?

Option	pH	Protein	LDH	Glucose
1	7.1	26	Low	3
2	7.1	34	High	3
3	7.3	26	Low	5
4	7.3	34	Low	5
5	7.3	34	High	5

1. Low pH Transudate – Unlikely clinical scenario
2. Low pH Exudate – Empyema/Complex Parapneumonic Effusion, Malignancy, TB, CTD, Oesophageal Rupture
3. Transudate – Any cause
4. Transudate – Any cause
5. Exudate – Any cause of exudate except Empyema/Complex Parapneumonic Effusion – Including Simple Parapneumonic Effusion



- Mrs DR makes a good recovery from her pneumonia being discharged after 7 days.
- At 6 weeks her consolidation has resolved.
- Despite her new found gratitude for the NHS she reverts to her previous existence of preferring to take medical advice from her cleaner rather than her son (yours truly)!



Pneumonia Summary

- Describe symptoms and signs of pneumonia
- Risk stratification in Pneumonia (CURB65)
- Severity based management of pneumonia
- Name organisms causing pneumonia and how they're identified
- Pleural Effusion:
 - Analysis
 - Causes
 - Management



The background of the slide consists of several white rectangular cards scattered across a dark surface. Each card has a large, bold, black question mark printed on it. The cards are slightly overlapping and tilted at various angles, creating a sense of depth and movement. The lighting is soft, highlighting the texture of the paper.

Any Questions?

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[@TB_doc](#)