Respiratory Disorders

BELMATT
HEALTHCARE TRAINING

PRECOURSE WORKBOOK

RESPIRATORY SESSION

AIMS
To develop your consultation skills and clinical decision-making in managing patients who present with respiratory symptoms in primary care and general practice.

OBJECTIVES
- Explore common upper and lower respiratory infections
- Recognise common respiratory symptoms including cough, shortness of breath, sputum and its implications.
- Differentiate between the common types of obstructive lung diseases, including COPD, asthma, and cystic fibrosis
- Improve knowledge of common treatment options available in primary care using NICE and local guidelines.
- Able to assess, treat and safely discharge or refer respiratory conditions presenting to primary care settings.

RECOMMENDED READING

Respiratory Assessment article by Kirsty Armstrong, session lecturer.
https://www.researchgate.net/publication/336798109_Taking_a_patient_history_as_part_of_respiratory_assessment

Below are the March 2020 Updated guidelines for respiratory disorders

https://www.uptodate.com/contents/table-of-contents/primary-care-adult/primary-care-pulmonary-disease

Acute bronchitis: https://www.uptodate.com/contents/acute-bronchitis-in-adults

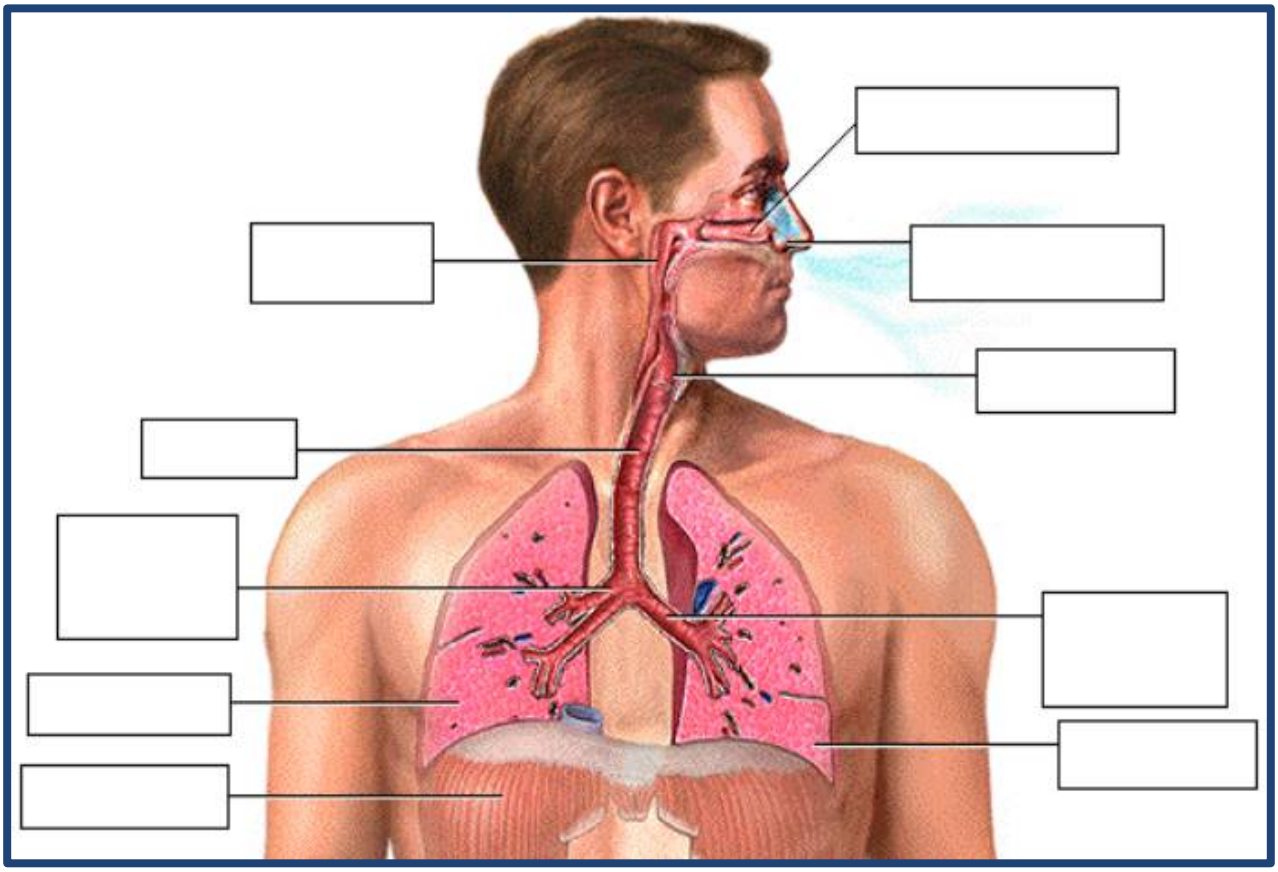
Asthma: https://www.uptodate.com/contents/acute-exacerbations-of-asthma-in-adults-home-and-office-management

COPD: https://www.uptodate.com/contents/chronic-obstructive-pulmonary-disease-definition-clinical-manifestations-diagnosis-and-staging

Dyspnoea: https://www.uptodate.com/contents/approach-to-the-patient-with-dyspnea

Evaluation of acute and subacute cough: https://www.uptodate.com/contents/evaluation-of-subacute-and-chronic-cough-in-adults

LABEL THE DIAGRAM



Please watch this video on respiratory anatomy and physiology.

https://www.youtube.com/watch?v=0fVoz4V75_E

https://www.youtube.com/watch?v=x5x19lwPnbo

Upper Respiratory Tract Infections

https://www.osmosis.org/learn/Upper_respiratory_tract_infection

CLICK ON LINK TO WATCH VIDEO ON VIRUSES

https://www.youtube.com/watch?v=s8jhJXgC-bk

RESPIRATORY PATHOLOGIES

There are 2 types of respiratory disorders and diseases

1. Infectious – Pulmonary infections are usually bacterial or viral
2. Chronic – includes persistent and long lasting diseases such as asthma.

Infectious Diseases : Name 3 viral and bacterial infections that can affect the respiratory tract

VIRAL	BACTERIAL

How are viruses and bacteria different? Click on this link to watch a short online video.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5654539/

INFLUENZA: https://www.youtube.com/watch?v=85R-6O6rrgw

PNEUMONIA: https://www.youtube.com/watch?v=IAQp2Zuqevc

PLEURAL EFFUSSION: https://www.youtube.com/watch?v=gASiQ2I_4KY

LUNG CANCER: https://www.youtube.com/watch?v=HeEiQKoicd8

COPD: https://www.youtube.com/watch?v=yKQJNMUFkjk

EMPHYSEMA: https://www.youtube.com/watch?v=ChlSfDBHLvg

ASTHMA: https://www.youtube.com/watch?v=gvxF_TJhHiA

DESCRIBE THE FOLLOWING CONDITIONS:

1. CHRONIC OBSTRUCTIVE DISEASE

a) Emphysema
b) Chronic Bronchitis

2. What is inherited emphysema and how do you check if a patient has it?

_____
_____
_____

3. What do the following tests examine?

a) Chest x-ray and CT Chest
b) ECG
c) Sputum Analysis
d) Spo2
e) Spirometry
f) FENO testing
g) Blood tests: name tests relevant to respiratory conditions and discuss why?
h) Pulmonary Functions Test

CASE STUDY 1

A 66-year-old man presented to his primary care practitioner with a headache, fever, and cough for the previous 3 days, and recent bouts of confusion. The patient had smoked cigarettes (approximately 1 pack per day) since age 17, had had type 2 diabetes mellitus for 15 years, and had coronary artery bypass surgery 12 years ago. He was treated with a macrolide (azithromycin) for sinusitis 8 weeks before presentation. Vital signs were as follows: temperature, 100.8°F (38.2°C); pulse, 110 beats per minute, respiratory rate, 28 breaths per minute. Auscultation of his lungs revealed rhonchi in the right lower lobe.

What other investigations does he need?

_____
_____

What are the differential diagnoses?

_____
_____

How common are these and how would you treat them?

_____
_____

CASE STUDY 2 & 3

Mr Smith is a 74-year-old man looking for advice. He recently received a diagnosis of chronic obstructive pulmonary disease (COPD) and wants to make sure he is doing everything he can to reduce his chances of complicating or exacerbating his condition. Mr Smith has a significant medical history, including coronary artery disease post stent placement, heart failure, hypertension, and high cholesterol, along with his new diagnosis of COPD. He has an extensive medication list, which includes various pharmacologic agents for managing these conditions. He started smoking as a teenager and quit cold turkey several years ago at the urging of his cardiologist.

What information can you provide regarding self-management of his COPD?

_____

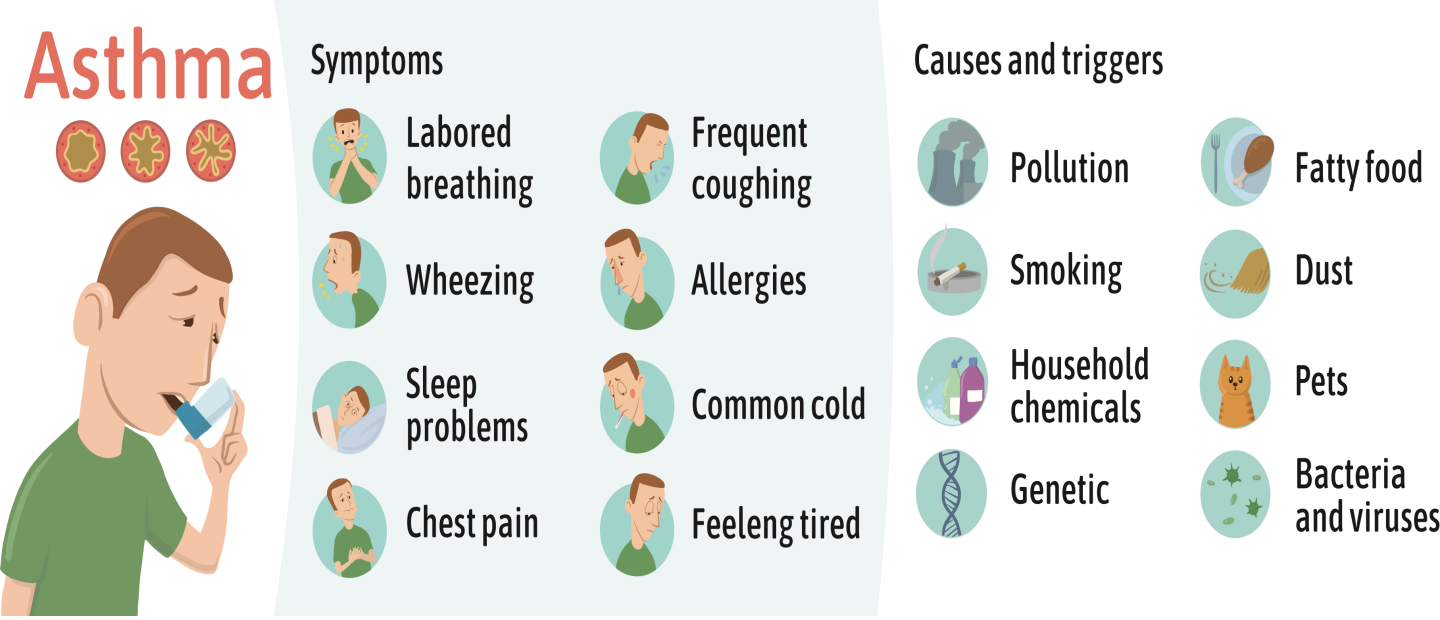
_____

Mrs Jones is a 38-year-old female who calls the surgery to ask about her flu like symptoms. She works as an elementary school teacher and reports a sudden onset of chills, fatigue, general malaise, and muscle pains that caused her to be sent home out of fear that she had the flu, even though she had received her influenza vaccine. Upon arriving home, she took her temperature and confirmed a fever of 38.6 degree Celsius. She reports no significant medical history and says she takes no chronic medications other than occasional non prescription medicines for mild conditions. She has a lot has a lot of cold and cough preparations at home, along with some pain relievers, but she wants to know what will best alleviate her symptoms and help her recover as quickly as possible.

What recommendations or education on self-care for managing flulike symptoms can you offer?

_____

_____



CASE STUDY 4 & 5

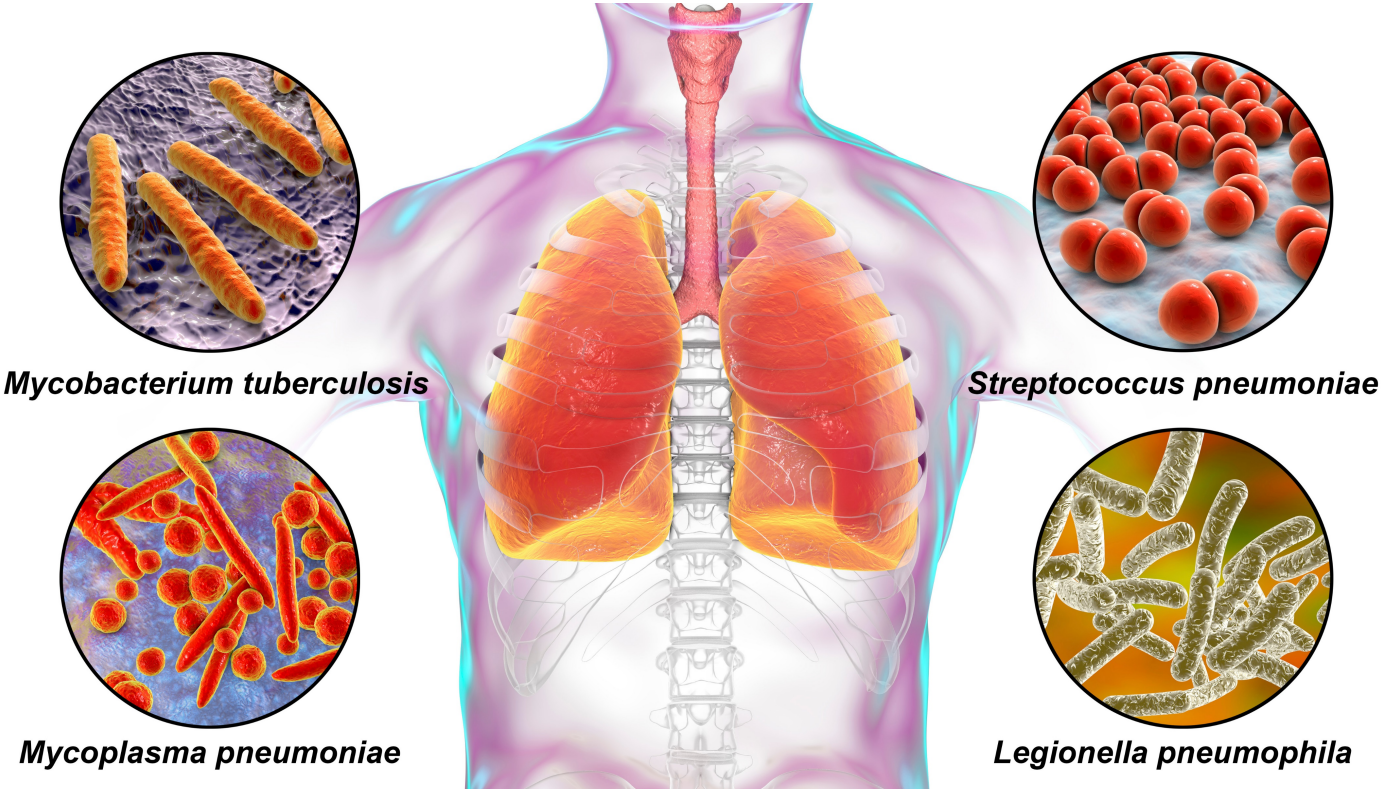
Mr Andrews is a 23-year-old male seeking advice. Although he is generally in good health, he has recently been developing a mild wheezing and tightness in his chest after exercising and playing soccer. He does not smoke and has not had any respiratory illnesses recently. However, he does recall using an inhaler as a child for asthma but was told that he had outgrown the condition.

How would you manage this patient?

John, 37 presents to you with a 3 week history of a cough. He had a cold with a fever about 4 weeks ago and after a week of the cold developed this cough, which is dry, irritating and non-productive. He has no significant PMH or FH but how can you be sure of this?
Document your systematic history taking sequence. Following history taking you take his vital signs which are T 36.5, RR 14, B/P 125/90, P62
You listen to his chest there are no added sounds.
What 4 techniques would you use in this examination to check his chest?

What other types of the examination or near patient testing should you include?

All is normal – what are your conclusions and management/recall of this patient?



MULTI CHOICE QUESTIONS

A 58-year-old man with a BMI of 32 comes to the surgery. He states he gets very short of breath after climbing a flight of stairs. His SOB is associated with a cough and productive green sputum. He has had symptoms like these for at least four months out of the year over the past decade, but they have been consistently present for the past 6 months and seem to be worsening in severity. The patient admits to smoking about a pack of cigarettes a week for the past 20 years. He has never received flu vaccine. He is worried that this could be related to his family history of cardiac issues. He is afebrile, there is no sign of oedema and heart sounds appear to be normal.

Which of the following findings is most likely to be observed on physical examination?

a) COPD
b) Asthma
c) Obstructive sleep apnoea
d) Heart Failure
e) Emphysema

YOUR ANSWER _____

MULTI CHOICE QUESTIONS

A 30-year-old man comes to the clinic because of fatigue and sleepiness throughout the day. His past medical, family, and social histories are non-contributory. His wife says he snores very loudly while sleeping and she has recently noticed that he will stop breathing.momentarily, multiple times throughout the night. spo2: 90%. He has a BMI of 33kg/m2, having gained 5.4-kg (12-lb) over the past year without any significant lifestyle or dietary changes. You advise the patient to lose weight and see a relevant specialist.

Which is the most likely cause of this patient's condition?

a) Anaemia
b) Obstructive sleep apnoea
c) Orthopnea
d) Diabetes Mellitus
e) Heart failure

YOUR ANSWER _____

A 23-year-old college student comes to the surgery with a 2 day history of a non-productive cough, feeling feverish and "feeling sick" for 2 days. She says she has a final exam tomorrow and wants some medicine so she feels better during the test. Her temperature is 37.2°C, P87/min, RR18/min, and BP 117/78 mm Hg. Examination shows clear lung sounds bilaterally in all fields. There is no cervical lymphadenopathy. She has some pharyngeal erythema with neither exudates nor vesicles.

Which of the following is the most appropriate next step in the management of this patient?

a) Refer to emergency department for intravenous antibiotics
b) Refer for chest x-ray
c) Discharge with oral antibiotics
d) Reassure and discharge
e) Give oral steroids

YOUR ANSWER _____

A 5-year-old girl is brought to the emergency department by her parents because of a sore throat and difficulty swallowing that began 3 days ago. Her temperature is 39.2 °C , pulse is 92/minute, respiration rate 22/minute, and blood pressure is 100/73 mm Hg. Her O2 saturation of 98% on room air. Physical examination shows an erythematous oropharynx, bilateral tonisillar exudates, and cervical lymphadenopathy. During the examination, the patient resists moving her head and begins drooling.

Which of the following is the most likely diagnosis?

a) Meningitis
b) Croup
c) Epiglottitis
d) Peritonsillar abscess
e) Retropharyngeal abscess

YOUR ANSWER _____

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YOUR ANSWER _____

46-year-old man comes to the surgery with 3 day history of shortness of breath and increasing difficulty in breathing. He has a productive cough with green and yellow phlegm, with dyspnea that worsens with minimal exertion. He has experienced no fever, chills or chest pain. He is otherwise generally well except from a morning cough that brings up white sputum which he has been for many years. He has a 40 pack year history of smoking. No immunization history. SPO2 88% on room air and no cyanosis. Prolonged expiratory phase and bilateral expiry wheeze on auscultation

What is the most likely diagnosis?

a) Acute exacerbation of COPD
b) Bronchial pneumonia
c) Bronchiectasis
d) Congestive cardiac failure
e) Viral pneumonia.

YOUR ANSWER _____

RESPIRATORY GUIDELINES

Respiratory Session

Presenting Complaint (PC)
It's important to use open questioning to elicit the patient's presenting complaint.
"So what's brought you in today?" or *"Tell me about your symptoms"*
Allow the patient time to answer, trying not to interrupt or direct the conversation.
Facilitate the patient to expand on their presenting complaint if required.
"Ok, so tell me more about that" "Can you explain what that pain was like?

Symptoms
- Cough: Productive (bronchiectasis / COPD if older / CF if younger) Dry (asthma if younger / ILD if older)
- Wheeze (expiratory) – asthma / COPD / bronchiectasis
- Stridor (inspiratory) – upper airway obstruction

Shortness of Breath
SOB during activities of daily living
Asthmatic-tightness in chest
CHF- sensation of suffocating
COPD- complain of increased effort to breath

Shortness of Breath
Ask about temperature control over the past 48 hours

Sputum Colour/consistency, odour
Blood: Consider TB, cancer, paroxysmal
Green: Inflammation
Yellow: Infection
White Frothy: Heart Failure

Allergies

Consider

Family History
Respiratory disease? – asthma / atopy / lung cancer / cystic fibrosis
Recent contact with others who were unwell? – viral infections / pneumonia / TB

Social History
Smoking – How many cigarettes a day? How long have they smoked for?
Alcohol – How many units a week? – be specific about type / volume / strength of alcohol

Recreational drug use – e.g. Cannabis (increased risk of lung cancer)

Living situation:
• House / Flat – stairs / adaptations / home oxygen
• Who lives with the patient? – important when considering discharge from hospital
• Any carer input? – what level of care do they receive?

Activities of daily living:
• Is the patient independent / able to fully care for themselves?
• Can they manage self-hygiene/housework/food shopping?

Occupation:
• **Shipyard** / Construction / Plumber – Asbestos
• **Miners** – Pneumoconiosis
• **Farmer** – Allergic extrinsic alveolitis

Hobbies – Bird fancier – Allergic extrinsic alveolitis

Systemic enquiry

Systemic enquiry involves performing a brief screen for symptoms in other body systems. This may pick up on symptoms the
patient failed to mention in the presenting complaint. Some of these symptoms may be relevant to the diagnosis (e.g. calf pain
in pulmonary embolism).
Choosing which symptoms to ask about depends on the presenting complaint and your level of experience.

Cardiovascular – Chest pain / Palpitations / Dyspnoea / Syncope / Orthopnoea / Peripheral oedema

Respiratory – Dyspnoea / Cough / Sputum / Wheeze / Haemoptysis / Chest pain

GI – Appetite / Nausea / Vomiting / Indigestion / Dysphagia / Weight loss / Abdominal pain / Bowel habit

Urinary – Volume of urine passed / Frequency / Dysuria / Urgency / Incontinence

CNS – Vision / Headache / Motor or sensory disturbance/ Loss of consciousness / Confusion

Musculoskeletal – Bone and joint pain / Muscular pain

Dermatology – Rashes / Skin breaks / Ulcers / Lesions

Systemic enquiry

Assess temperature – ↓ temperature suggests peripheral vasoconstriction / poor perfusion
Palpate pulse – rate and rhythm
Assess respiratory rate – normal adult range = 12-20 breaths per minute
Pulsus paradoxus – pulse wave volume decreases with inspiration – asthma / COPD

General Inspection

Age:
• Young patients – more likely asthma or cystic fibrosis (CF)
• Older patients – more likely COPD/interstitial lung disease (ILD)/malignancy

Treatments or adjuncts around bed – O2 (ILD, COPD) / inhalers or nebulisers (asthma, COPD) /sputum pots (COPD, bronchiectasis)

Does patient look short of breath? – tripod position / nasal flaring / pursed lips / use of accessory muscles / intercostal muscle recession

Is the patient able to speak in full sentences?
Scars (more details in the close inspection of the thorax section below)
Cyanosis – bluish/purple discolouration – (<85% oxygen saturation)
Chest wall – note any abnormalities or asymmetry – e.g. barrel chest (COPD)
Cachexia – very thin patient with muscle wasting (malignancy, cystic fibrosis, COPD)

Head and Neck

Conjunctival pallor – ask patient to lower an eyelid to allow inspection – anaemia is associated with pallor

Horner's syndrome – ptosis / constricted pupil (miosis) /anhidrosis on affected side / enophthalmos

Central cyanosis – bluish discolouration of the lips / inferior aspect of tongue

Jugular venous pressure (JVP) – a *raised JVP* may indicate *pulmonary hypertension / fluid overload*
• Ensure the patient is positioned at 45°
• Ask patient to turn their head away from you
• Observe the neck for the JVP – located inline with the sternocleidomastoid
• Measure the JVP – number of centimetres measured vertically from the sternal angle to the upper border of pulsation

Hands

Start with a handshake , gives you a chance to examine the hands.
• Tar staining on fingers (or nicotine patches on body)- smoker – increased risk of COPD / lung cancer
• Clubbing – lung cancer / interstitial lung disease / bronchiectasis
• Peripheral cyanosis – bluish discolouration of nails – O2 saturation <85%
• Features of rheumatological disease (e.g. joint swelling/tenderness) – rheumatological diseases (e.g. rheumatoid arthritis)
can be associated with pleural effusions and pulmonary fibrosis
• Skin changes – bruising and thinning of the skin are associated with long-term steroid use (ILD / asthma / COPD)

Fine tremor – can be a side effect of beta 2 agonist use (e.g. salbutamol)
Flapping tremor – CO2 retention – type 2 respiratory failure – e.g. COPD

Chest Inspection

Scars
• Small mid-axillary scars (e.g. chest drains)
• Horizontal postero-lateral scars (thoracotomy from e.g. lobectomy/pneumonectomy)

Skin changes – may indicate recent or previous radiotherapy – erythema / thickened skin

Asymmetry – major surgery:
• Pneumonectomy (usually for cancer)
• Thoracoplasty (rib removed / previously used to treat tuberculosis)

Deformities – barrel chest (COPD) / pectus excavatum and carinatum

Tracheal Shift
• The trachea deviates away from pneumothorax and large pleural effusions. The trachea deviates towards lobar collapse and pneumonectomy.
• Palpation of the trachea can be uncomfortable, so warn the patient and apply a gentle technique

Chest Palpation

Apex beat: Normal position is 5th intercostal space – mid-clavicular line
Right ventricular heave is noted in cor-pulmonale (right heart failure secondary to chronic hypoxic lung diseases such as COPD
or ILD)

Chest expansion:
Place your hands on the patient's chest, inferior to the nipples

- Wrap your fingers around either side of the chest
- Bring your thumbs together in the midline, so that they touch
- Ask patient to take a deep breath
- Observe movement of your thumbs, they should move apart equally
- If one of your thumbs moves less, this suggests reduced expansion on that side
- Reduced expansion can be caused by lung collapse / pneumonia

Percussion

Technique is very important!

1. Place your non-dominant hand on the chest wall
2. Your middle finger should overlie the area you want to percuss (between ribs)
3. With your dominant hand's middle finger, strike the middle phalanx of your non-dominant hand's middle finger
4. The striking finger should be removed quickly, otherwise you may muffle resulting percussion note

- **Supraclavicular** (lung apices)
- **Infraclavicular**
- **Chest wall** (3-4 locations bilaterally)
- **Axilla**

Auscultation

Ask the patient to take deep breaths in and out through their mouth.

Assess quality:
• Vesicular - normal
• Bronchial - harsh sounding – similar to auscultating over the trachea – inspiration and expiration are equal and there is a
pause between) – associated with consolidation

Assess volume:
• Quiet breath sounds suggest reduced air entry – consolidation / collapse / pleural effusion
• State reduced breath sounds rather than reduced air entry when presenting

Added sounds:
• Wheeze – asthma / COPD
• Coarse crackles – pneumonia / bronchiectasis / fluid overload
• Fine crackles – pulmonary fibrosis

Tacheal sounds-side to side of trachea harsh high pitched
Bronchial-loud high pitched
Vesicular-slow pitched soft

Normal, dull decreased, hyper-increased resonance- dull fluid outside lungs or soft tissue or fluid filling parenchymapneumonia/tumour

Hyper resonance- COPD air trapping or pneumothorax
Vocal resonance:
• Ask patient to say “99” repeatedly and auscultate the chest again
• Increased volume over an area suggests increased tissue density (especially if there is a dull percussion note over the same
area) – consolidation / tumour / lobar collapse
• Decreased volume over an area (especially if there is an associated dull percussion note) suggests fluid outside of the lung
(pleural effusion)

Use of vocal fremitus, whispered pectoriloquy

Tactile **fremitus** is a vibration that you can feel with the palm of your hands when someone says "blue moon" or
"99". **Increased fremitus** is a sign of consolidation. Decreased **fremitus** is a sign of pneumothorax or pleural effusion. Think of physics and impedance. Dullness to percussion: pleural effusion, pneumonia

Oedema

Examine the sacrum for oedema (fluid overload in cor pulmonale)
Examine the legs:
• Pitting oedema (fluid overload in cor pulmonale)
• Assess the calves for signs of deep vein thrombosis
• Inspect for evidence of erythema nodosum (associated with sarcoidosis)

Diagnosis

1. Whooping cough-incubation period 7 days and patient infectious for 3 weeks after the onset of symptoms. immunisation?>14
days. Inspiratory whoop, post-tussive vomiting or paroxysmal cough. Notifiable disease
2. Pneumonia-the alveoli become inflamed and fill with liquid. fever, increased inspiration, tachycardia, including fremitus,
crackles, bronchial sounds, hypoxia
3. Pulmonary embolism
4. COPD-SOB wheezing and coughing, weight loss, barrel-chested- tripoding
5. Bronchitis-infection of bronchi.
6. Asthma- RR more than 25/min HR more than 110bpm
7. Pneumothorax, haemothorax, pleural effusion

Red Flags

Arrange emergency admission for people with clinical features of serious illness, including:
Respiratory rate of more than 30 breaths per minute Tachycardia greater than 130 beats per minute.
Systolic blood pressure less than 90 mmHg, or diastolic blood pressure less than 60 mmHg (unless this is normal for them).
Oxygen saturation less than 92%, or central cyanosis (if the person has no history of chronic hypoxia).
Peak expiratory flow rate less than 33% of predicted. Altered level of consciousness.
Use of accessory muscles of respiration (particularly if the person is becoming exhausted).

How do I diagnose the cause of sub-acute cough?

Assess whether the person has clinical features of the following differential diagnoses of sub-acute cough:
1. Foreign body aspiration — suggested by sudden-onset cough, stridor (upper airway) or reduced chest wall movement on the affected side,
bronchial breathing, and reduced or diminished breath sounds (lower airway).
2. Lung cancer — suggested by haemoptysis, persistent chest and/or shoulder pain, breathlessness, weight loss, hoarseness, finger clubbing,
cervical or supraclavicular lymphadenopathy. For more information
3. Pulmonary tuberculosis — suggested by sputum, breathlessness, haemoptysis, weight loss, fever, night sweats, anorexia, general malaise,
and finger clubbing. For more information,
4. Post-infectious cough — suggested by persistent dry cough that started with an obvious respiratory tract infection, systemically well, normal
respiratory examination.
5. Bronchitis — suggested by breathlessness, wheeze, or general malaise.
Crackles, if present, should clear with coughing..
6. Pneumonia — suggested by at least one symptom of breathlessness, sputum, wheeze, or pleuritic pain, focal chest signs such as dull
percussion note, bronchial breathing, or coarse crackles, plus at least one systemic feature such as fever or myalgia.

How do I diagnose the cause of sub-acute cough?

There may be signs of an associated pleural effusion..
7. Asthma — suggested by wheeze, breathlessness, worsening symptoms at night, in the morning, or with exercise, and exposure to allergens.
Peak expiratory flow rate is reduced during an episode.
8. Pertussis (whooping cough) — suggested by paroxysms of coughing that often increase in frequency and severity as the condition progresses
and usually persist for 2–6 weeks. There may be vomiting after coughing, or an inspiratory whoop. Occasionally the cough may persist for several
months.

BRONCHITIS

RED FLAGS

Is systemically unwell.
• Is at high risk of serious complications due to a pre-existing comorbid
condition such as heart, lung, kidney, liver or neuromuscular disease, or immunosuppression.
• Is >65 years with ≥2 of the following, or >80 years with ≥1 of the following:
• Hospital admission in the previous year.
• Type 1 or type 2 diabetes mellitus.
• Known congestive heart failure.
• Concurrent use of oral corticosteroids.

WHEN TO REFER/ TREATMENT

Prescribe amoxicillin 500 mg three times daily for 5 days, or if there is
a true penicillin allergy, doxycycline 200 mg on the first day then 100
mg once daily, for a total of 5 days.
• If amoxicillin and doxycycline are contraindicated, prescribe clarithromycin 500 mg twice daily for 5 days
After the acute infection, consider whether pneumococcal or influenza immunization is necessary

COMMUNITY ACQUIRED PNEUMONIA

RED FLAGS

The choice of antibiotic indicated is dependent on the severity of the illness.

If CRB-65 score is 0, prescribe amoxicillin 500 mg three times daily for 5 days, or if there is a true penicillin allergy, prescribe doxycycline 200 mg on the first day then 100 mg once daily, for a total of 5 days, or clarithromycin 500 mg twice daily for 5 days.

Review the person after 3 days, and if the response is poor, extend duration of treatment to 7-10 days.

If CRB-65 score is 1 or 2, consider prescribing dual therapy with amoxicillin 500 mg three times daily and clarithromycin 500 mg twice daily for 7-10 days, or monotherapy with doxycycline for 7-10 days.

- For details of how to calculate the CRB-65 score.
- For details of dosing regimens, contraindications, and adverse effects of these antibiotics,

Advise the person to seek medical advice within 3 days if symptoms do not begin to improve, or earlier if symptoms worsen as hospital admission may be needed.

WHEN TO REFER/ TREATMENT

Use CRB-65 score to help decide whether a person with suspected community-acquired pneumonia required hospital admission

- Score of 3 or more, arrange urgent admission to hospital.
- Score of 2, hospital admission is usually advised.
- Score of 0 or 1, treatment at home may be appropriate, depending on clinical judgement and available social support.

Use clinical judgement in deciding if a person should be admitted. Other factors that should also be considered include:

1. The person's wishes.
2. Social support available.
3. Pre-existing comorbid conditions and general frailty.
4. If the person is pregnant.
5. Pulse oximetry - people with oxygen saturation less than 94% require admission to hospital.
6. Arrange chest X-ray after 6 weeks for all people:With symptoms and signs that are slow to resolve or persist despite treatment.
7. Who smoke and are over 60 years of age.
8. Ensure smoking cessation advice is given and reinforced (where appropriate

Explain to the person that after starting antibiotic treatment, symptoms should improve, although the rate of improvement will vary with the severity of illness. Discuss the natural history of pneumonia symptoms, that by:

- 1 week - fever should have resolved.
- 4 weeks - chest pain and sputum production should have substantially reduced.
- 3 months - most symptoms should have resolved but fatigue might still be present.
- 6 months - symptoms should have fully resolved.

Additional Tips on Treatment

Analgesics
The recommendation to use paracetamol or ibuprofen for symptomatic relief is pragmatic, based on what CKS considers to be good medical practice.

Preventing dehydration
The recommendation that adequate fluid intake should be maintained is pragmatic, based on what CKS considers to be good medical practice. Dehydration occurs in people with acute bronchitis due to increased fluid losses from sweating and/or a reduced fluid intake due to general malaise. Many of the symptoms of dehydration such as headache, dry mouth, and general malaise may be wrongly attributed to their infective illness rather than dehydration.

Cough Medicines
Over the counter cough medicines are not recommended to suppress a productive cough because they suppress the natural mechanism that keeps the airway clear. Additionally, there is no good evidence that cough medicines available over the counter are effective [Smith, 2014].

Smoking Cessation
The recommendation to advise smoking cessation is pragmatic, based on what CKS considers to be good medical practice. Smoking causes irritation to the bronchial tree which is already inflamed due to infection. Smoking cessation reduces the risk of further episodes of acute bronchitis, in addition to conferring many other health benefits.

Antibiotic Prescribing

The recommendations not to prescribe antibiotics for people with acute bronchitis who are otherwise well; on the people for whom an antibiotic is recommended; and to consider a delayed prescription strategy in people who are otherwise well, are based on expert opinion in the National Institute for Health and Care Excellence (NICE) guideline Prescribing of antibiotics for self-limiting respiratory tract infections in adults and children in primary care[NICE, 2008]. The recommendation on using C-reactive protein (CRP) test results to guide antibiotic prescribing are based on expert opinion in the National Institute for Health and Care Excellence (NICE) guideline Diagnosis and management of community- and hospital-acquired pneumonia in adults[HPA, 2009].

Delayed Prescribing

1. The majority of people who have not improved on antibiotics will have a viral infection and a period of watchful waiting will therefore not cause any deterioration in their condition.
2. In a minority of people, the illness might be caused by a streptococcal infection resistant to amoxicillin, or an atypical bacterial infection not susceptible to any penicillin antibiotics. Prescribing a second-line antibiotic may therefore result in improvement.

- Co-amoxiclav should be effective against penicillin-resistant strains of Streptococcus pneumoniae, Moraxella catarrhalis, and Haemophilus influenzae.
- Doxycycline has a different spectrum of activity to amoxicillin, and should be considered if previous treatment failure was suspected to be due to Mycoplasma pneumoniae or Chlamydia pneumonia

Clarithromycin

- Body weight under 8 kg: 7.5 mg/kg twice a day.
- Body weight 8–11 kg: 62.5 mg twice a day.
- Body weight 12–19 kg: 125 mg twice a day.
- Body weight 20–29 kg: 187.5 mg twice a day.
- Body weight 30–40 kg: 250 mg twice a day.
- Child 12–16 years: 250 mg twice daily, increased if necessary in severe infections to 500 mg twice a day.

Erythromycin
• Neonate: 3 mg/kg 4 times daily.
• Child 1 month –16 years: 3 mg/kg 4 times daily

Azithromycin
• Child over 6 months: 10 mg/kg once daily (max. 500 mg once daily), or
• Body-weight 15–25 kg: 200 mg once daily.
• Body-weight 26–35 kg: 300 mg once daily.
• Body-weight 36–45 kg: 400 mg once daily.
• Body-weight over 45 kg: 500 mg once daily.

Amoxicillin
Contraindications and cautions
1. Do not prescribe amoxicillin to people with a true penicillin hypersensitivity. Gastrointestinal adverse effects alone (such as nausea, vomiting, or diarrhoea) do not constitute an allergy to penicillin.
2. Prescribe amoxicillin with caution in people with:
a. Hypersensitivity to cephalosporins.
b. Chronic kidney disease (CKD) - reduce the dose of amoxicillin
Adverse effects are mainly gastrointestinal and include nausea, vomiting, and diarrhoea. These are usually mild.

Drug interactions
1. Allopurinol - be aware of increased risk of rash when allopurinol given with amoxicillin. It is not necessary to stop either drug if this occurs.
2. Warfarin - monitor international normalized ratio (INR) closely during concomitant use. Any significant changes seem to occur after 4 days of concurrent use.
3. Methotrexate - consider measuring platelet and white cell counts twice weekly for 2 weeks initially, and measure methotrexate levels if toxicity is suspected.
4. Oral hormonal contraception - additional contraceptive precautions are not required during or after courses of amoxicillin.

However, women should be advised about the importance of correct contraceptive practice if they experience vomiting or diarrhoea. For further information, see the sections on vomiting or diarrhoea in the CKS topics on contraception combined and contraception progestogen only.
For more information on drug interactions with amoxicillin, see the British National Formulary.

Co-Amoxiclav

Contraindications and cautions

- Do not prescribe co-amoxiclav to people with:
    - o A true penicillin hypersensitivity. Gastrointestinal adverse effects alone (such as nausea, vomiting, or diarrhoea) do not constitute an allergy to penicillin.
    - o History of penicillin-associated hepatic dysfunction.
- Prescribe co-amoxiclav with caution to people with:
    - o Hypersensitivity to cephalosporins.
    - o Hepatic impairment.
    - o Chronic kidney disease (CKD) - reduce the dose if the eGFR is 30 mL/minute/1.73 m2 or less.

Adverse Effects

1. The most common adverse effects of co-amoxiclav include nausea, vomiting, skin rash, and diarrhoea.
2. Consider pseudomembranous colitis if a person develops severe diarrhoea during or after treatment with co-amoxiclav. Pseudomembranous colitis is an acute, exudative colitis caused by Clostridium difficile, a Gram-positive toxin releasing bacillus. It often follows antibiotic treatment. For more information, see the CKS topic on Diarrhoea - antibiotic associated.
3. Co-amoxiclav can also cause fungal infection and vaginitis.
4. Anaphylaxis (delayed or immediate) is a serious but rare adverse effect of co-amoxiclav. For more information, see the CKS topic on Angio-oedema and anaphylaxis.
5. Hepatitis and cholestatic jaundice may rarely occur following treatment with co-amoxiclav

Doxycycline

Do not prescribe doxycycline to:

1. Pregnant or breastfeeding women.
2. People with:

- Liver disease.
- Systemic lupus erythematosus.
- Myasthenia gravis.
- Porphyria.

Adverse Effects

Gastrointestinal adverse effects, such as nausea, vomiting, and diarrhoea.
Less frequently, doxycycline may cause photosensitivity. Crucial to advise the person to minimize exposure to direct sunlight.
Severe adverse effects are unusual with a short course. However, benign intracranial hypertension has rarely been reported following treatment with a tetracycline. If a person taking doxycyline develops headache and visual disturbances, the drug should be stopped immediately.

Drug Interactions

1. Phenobarbital, carbamazepine, phenytoin, and primidone - metabolism of doxycycline may be accelerated by these drugs, leading to a reduced plasma concentration. Monitor the therapeutic effect of doxycyline, as a dose increase may be necessary.
2. Rifampicin - may cause a reduction in doxycycline levels, leading to undertreatment. Monitor the effects of concurrent use and increase the doxycycline dosage as necessary.
3. Sucralfate and antacids - can reduce the absorption of tetracyclines. Advise the person taking tetracycline to wait at least 2 hours before taking sucralfate or antacids.
4. Oral hormonal contraception - additional contraceptive precautions are not required during or after courses of doxycycline.
5. However, advise women about the importance of correct contraceptive practice if they experience vomiting or diarrhoea. For further information, see the sections on vomiting or diarrhoea in the CKS topics on Contraception – combined hormonal methods and Contraception - progestogen-only methods.

For more information on drug interactions with doxycycline, see the British National Formulary.

Clarithromycin

Contraindications and cautions

1. Do not prescribe clarithromycin to people:

- With severe hepatic impairment in combination with renal impairment.
- Taking drugs that prolong the QT interval (for example haloperidol, sotalol, terfenadine, and pimozide) - macrolides can also prolong the QT interval, which is a risk factor for Torsades de pointes.
- With hypokalaemia - due to the risk of prolongation of the QT interval.
- With a history of QT prolongation or ventricular cardiac arrhythmia, including Torsades de pointes.

2. Prescribe clarithromycin with caution to people with:

- Mild to moderate hepatic impairment (or people concomitantly receiving potentially hepatotoxic drugs) - clarithromycin is mainly excreted by the liver.
- Moderate to severe renal impairment
- Use half the normal dose in severe renal impairment (eGFR less than 30 mL/min). Avoid Klaricid XL® (clarithromycin prolonged-release once daily tablets) in people with eGFR less than 30 mL/min, as the dose cannot be reduced.
- Myasthenia gravis - macrolides may aggravate weakness symptoms.
- Coronary artery disease, severe cardiac insufficiency, or bradycardia (less than 50 beats per minute) - increased risk of QT prolongation.

Adverse Effects

1. Nausea, vomiting, abdominal discomfort, and diarrhoea are the most common adverse effects of macrolides.
2. Consider pseudomembranous colitis if a person develops severe diarrhoea during or after treatment with clarithromycin.Pseudomembranous colitis is an acute, exudative colitis caused by Clostridium difficile, a Gram-positive toxin-releasing bacillus. It often follows antibiotic treatment. For more information, see the CKS topic on Diarrhoea - antibiotic associated.
3. Anaphylaxis is rarely associated with clarithromycin.
4. Hepatotoxicity (including cholestatic jaundice) and rash have been reported following treatment with clarithromycin.
5. Reversible hearing loss (sometimes with tinnitus) can occur after large doses of clarithromycin (1-2 g).
6. Other adverse effects reported rarely or very rarely include pancreatitis, QT interval prolongation, arrhythmias, Stevens-Johnson Drug interactions

Drug Interactions

1. **Carbemazepine** - clarithromycin inhibits the cytochrome P450 enzyme CYP3A4, resulting in reduced carbamazepine metabolism.
    a. Reduce the dose of carbamazepine by 30-50% during treatment with clarithromycin.
    b. Advise the person to report symptoms of carbamazepine toxicity (such as dizziness, diplopia, ataxia, or confusion).
    c. Warfarin - occasionally and unpredictably, the effects of warfarin may be markedly increased by macrolides.Monitor the international normalized ratio (INR), and adjust the warfarin dose accordingly.

2. Statins - there is an increased risk of myopathy (due to cytochrome P450 enzyme CYP3A4 inhibition) if clarithromycin is taken with atorvastatin or simvastatin.

a. For simvastatin - do not prescribe clarithromycin to a person taking simvastatin, as simvastatin is extensively metabolised by CYP3A4. If treatment with
clarithromycin cannot be avoided, stop treatment with simvastatin during the course of treatment.
b. For atorvastatin - avoid concurrent use with clarithromycin, as atorvastatin is moderately metabolised by CYP3A4. If concurrent use cannot be avoided, prescribe the lowest starting dose of atorvastatin (10 mg), and advise the person to report any muscle pain, tenderness, or weakness.
c. Other statins - clinically significant drug interactions resulting from cytochrome P450-mediated metabolism are not expected for rosuvastatin and pravastatin as they are not metabolized to a clinically significant extent by the cytochrome P450 system. Fluvastatin is not dependent on CYP3A metabolism; therefore, interaction with clarithromycin is unlikely. Nevertheless, advise the person to report any muscle pain, tenderness, or weakness.

3. Calcium channel blockers (CCBs) - due to an increased risk of hypotension, caution is advised with the concurrent use of macrolides and CCBs metabolised by CYP3A4 (such as verapamil, amlodipine, and diltiazem).

4. Oral hypoglycaemic drugs and insulin - the concomitant use of clarithromycin and oral hypoglycaemic drugs (such as sulphonylureas) and/or insulin can result in significant hypoglycaemia. Careful monitoring of blood glucose levels is recommended.

5. Drugs that prolong the QT interval (such as haloperidol, sotalol, terfenadine, and pimozide) - all macrolides can prolong the QT interval, and concomitant use of drugs that prolong the QT interval is not recommended. Seek advice from a microbiologist regarding a suitable alternative antibiotic.

6. Drugs that cause hypokalaemia (such as diuretics, corticosteroids, short-acting beta-2 agonists) - hypokalaemia is a risk factor for QT prolongation.
Seek advice from a microbiologist regarding a suitable alternative antibiotic.

7. Oral hormonal contraception - additional contraceptive precautions are not required during or after courses of erythromycin and clarithromycin.
However, women should be advised about the importance of correct contraceptive practice if they experience vomiting or diarrhoea. For further information, see the sections on vomiting or diarrhoea in the CKS topics on Contraception - combined hormonal methods and Contraception - progestogen-only methods.

For more information on drug interactions with macrolides, see the British National Formulary.

Erythromycin

1. Do not prescribe erythromycin to people with porphyria.

2. Prescribe erythromycin with caution to people with:

- Neonate <2 weeks (risk of hypertrophic pyloric stenosis)
- Hepatic impairment (or people concomitantly receiving potentially hepatotoxic drugs) — erythromycin is mainly excreted by the liver.
- Taking drugs that prolong the QT interval (for example haloperidol, sotalol, amisulpride, terfenadine [avoid use with terfenadine], and pimozide) — macrolides can also prolong the QT interval, which is a risk factor for Torsades de pointes.
- Moderate to severe renal impairment. Give a maximum dose for erythromycin of 1.5 a day in severe renal impairment due to the risk of ototoxicity.
- Myasthenia gravis — macrolides may aggravate weakness symptoms.
- Conditions that predispose to QT interval prolongation.

Azithromycin
Do not prescribe azithromycin to people:
1. With severe hepatic impairment.
2. Taking drugs that prolong the QT interval (for example haloperidol, sotalol, amisulpride, terfenadine, and pimozide) — macrolides can also prolong the QT interval, which is a risk factor for Torsades de pointes.
3. With hypokalaemia, due to the risk of prolongation of the QT interval.
4. With a history of QT prolongation or ventricular cardiac arrhythmia, including Torsades de pointes

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